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### ELECTRICAL DEVELOPMENT ON THE SUSQUEHANNA RIVER.

Strange as it may seem, the power resources of the Susquehanna River are little developed, notwithstanding that the river is one of the largest emptying into the Atlantic Ocean and that there is within easy transmission distance a much better potential market for the energy than probably anywhere else in the United States. Below Harrisburg the fall in the riverbed averages from 5 ft. to 8 ft. per mile, and it is here that the greatest opportunities for large hydroelectric developments exist. Yet the only points at which the stream is now being used to any great extent are at York Haven, where 15,000 kw is being developed, and at McCall Ferry, where an initial installation of 59,000 kw has been made. Between York Haven and the sea there is a fall of about 270 ft. and the mean annual discharge at York Haven is about 40,000 cu. ft. per second, so that on the assumption that 11 cu. ft. per second of water dropping 1 ft. is equal to a horse-power in a machine having an efficiency of 80 per cent, about 1,000,000 hp is available throughout the river. Only a small portion of this power is reclaimed from the water at McCall Ferry. There are, of course, many obstacles in the way of development, the most serious being the ice freshets and gorges which reduce or obliterate to a large extent the available head. There are also involved financial considerations of no mean proportions and competition with existing utilities in localities where cheap fuel is available, for rich coal fields are not a great way off. Some of these causes for a time retarded the hydroelectric development at McCall Ferry, the subject of a descriptive article appearing elsewhere in this issue, but the difficulties which beset the undertaking were eventually overcome and a profitable market was secured for the present output of the station in Baltimore, 40 miles away.

The McCall Ferry plant of the Pennsylvania Water & Power Company is one of the large hydroelectric stations of the country. As is the case with most large stations of this character, the energy is sold in bulk to existing companies, and in this respect the system is fortunate in having at the receiving end large steam stations which may be pressed into service when necessary. In the territory covered are many distributing plants, and these with the manufacturing sites owned by the company should, with a favorable rate for energy, insure the completed plant a full load. The station in its equipment does not depart from the accepted practice of the day, although from its civil-engineering side it has some special features peculiar to itself. The available head is 63 ft., and inasmuch as back water during flood periods will reduce the head somewhat the turbines are arranged to carry rated load even in time of flood, the draft tubes being in two parts. The generators are wound for 11,000 volts and the potential is stepped up to 70,000 volts for transmission. Steel towers fitted with sus-

pension insulators are employed for a two-circuit line to Baltimore. Although the distance of transmission is not over 40 miles, the better service obtained because of the higher potential and insulation of the line amply justifies the extra expenditure entailed by such construction. Experience with recent 110,000-volt lines operated side by side with 60,000-volt lines fitted with pin insulators proves the wisdom of such a course.

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**ELECTRIC SHIP PROPULSION.**

At first sight it would seem that the most unlikely and unfavorable place in the whole world for the transmission of power by electricity is between the engine and the propeller of one and the same steamship. On board a steamer the engine is of such a nature as to be readily capable of driving a longitudinal shaft or shafts, and the screw propeller is a device that has to be driven by a longitudinal shaft projecting from the hull. Consequently, it would seem that not only are the marine engine and the propeller naturally adapted to be directly coupled on one and the same shaft, but that any attempt to divorce these appropriate conjugal units would be economically disastrous and ludicrously ill-starred. Nevertheless, when we come to consider that the ordinary screw propeller is an essentially low-speed device while the steam turbine is essentially a high-speed engine, the above-stated proposition ceases to be so self-evident, and the possibility of overhauling the line of sequence presents itself.

The reciprocating marine engine of the multiple-expansion type is a low-speed machine. Its large masses naturally resist rapid reversals in direction of motion. Consequently, it is but natural that the reciprocating engine should be directly coupled to the propeller shaft. The steam turbine has certain manifest advantages in marine service. Its lightness, compactness, large specific output, balanced thrusts, simplicity of piping and freedom from oil-cup excrescences are all in its favor. Its great objection is its high speed and its uniformity of speed. If the steam-turbine is lowered in speed, its efficiency speedily vanishes. Moreover, if attempts are made to drive it at half speed, for economy in coal consumption, the ineconomy of the turbine partially offsets the possible economy of propulsion power.

In order, then, to realize the advantages of the steam turbine, and at the same time to maintain a reasonable efficiency in the screw propeller, it becomes necessary to introduce a mechanical transformer to exchange low torque and high speed into high torque and low speed. Such a transformer may be either mechanical or electrical. Some form of reducing gear would constitute a mechanical transformer. The combination of a generator and motor would constitute an electrical transformer. Each of these plans has its advocates. Theoretically, a set of reducing gear wheels would be much the simpler of the two, just as a gear-wheel reduction is used in practically every electric street car between the motors and the car axles. When, however, we come to examine the dimensions necessary in the gear mechanism for delivering the enormous torque required for propelling a vessel of the proportions of any one of the modern ocean greyhounds the difficulties in securing economy, efficiency and reliability become very evident.

The United States government is preparing to secure reliable data on the relative merits of these systems by building three large steam colliers, for naval service, all alike, and of equal displacement. On one of them, the *Cyclops*, will be placed reciprocating engines of 5600 hp, for driving the propeller at the speed necessary for 14 knots of ship velocity. On the second, the *Neptune*, is being placed a pair of steam turbines with gear reductions. On the third—the *Jupiter*—will be placed a single steam turbine and alternating-current generator, with a pair of synchronous motors on the propeller shafts. Preliminary tests of the turbo-generator set at the Schenectady factory of the General Electric Company were described recently in our columns. It is already claimed that the electric set will show a very distinct economy in steam consumption over the reciprocating engine set, and the final results of comparison between the three will be watched with great interest.

If the electric set should prove itself distinctly superior to the other two in actual service, it would be likely to pave the way for the introduction of similar electric sets not only in battleships, where coal economy is of great importance, but also on large passenger steamers. An incidental consequence would also probably be that alternating-current systems would supersede direct-current systems of lighting and motor service on board ship. It has been generally admitted that the induction motor is better adapted to propulsion service than any direct-current motor. Evidently, since the electric gearing is in competition with a single simple propeller shaft, only the simplest, crudest and most reliable type of electric motor has any chance of success. Whether the electric propulsion system comes into general adoption or not, the *Jupiter* will furnish a unique example of the electric transmission of power to a distance of only a few feet with economical intent. An abstract of a discussion of this general subject in *Elektrotechnik und Maschinenbau*, by Profs. Karl Zickler and Rudolf Czepek, is given in this week's *Digest*.

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**USE OF NAKED ALUMINUM WIRE IN ELECTROMAGNETS.**

In the early days of electrical investigations, the days of Franklin, Faraday and Henry, bare copper wire, of a kind, was obtainable, but the familiar covered wire of to-day was unknown. In winding a coil it was customary to separate the turns of each helical layer so as to have them air-insulated, while the successive layers were separated by paper or linen. As the art developed, machines were introduced for winding on layers of silk or cotton, until, at the present day, covered wire is so common that bare wire is rather the exception in electromagnetic structures. The early dynamo machines employed cotton or silk coverings as insulation for the active conductors. Only in very low-voltage machines could air insulation alone be relied upon. Edison tried at one time to substitute air insulation for cotton insulation, in his early direct-connected generators for central-station service; but the experience so obtained was not encouraging. Even at 120 volts pressure, short-

circuits occurred across air-spaces between moving conductors; apparently because partial vacua were developed in these air-spaces at high speeds. The progress of dynamo construction has rendered necessary the abandonment of cotton insulation in various forms of high-tension rotors. In some stator windings also, such as the field windings of railway motors, cotton insulation has given place to substances of greater heat-withstanding power. Nevertheless, a vast amount of silk-covered and cotton-covered wire finds its way every year into electromagnetic windings of all classes.

The cost per pound of covered wire is not much greater than that of bare wire, in large sizes; but as we come to the smallest sizes of copper wire, the extra cost of insulation naturally runs up very rapidly. Moreover, with moderate sizes of wire the coefficient of space utilization in the windings—that is, the ratio of the copper space to the total winding space—is nearly constant, and independent of the gage of wire; but when we come to very small wires, this rule is widely departed from and the coefficient becomes greatly reduced. The coils hold less copper, and more insulation, as the wire becomes smaller. This, in turn, unduly impedes the conduction of heat from the interior of the coil and adds to the internal temperature for a given number of watts expended in the winding. Finally, when covered copper wires of very small size are utilized, it is easy for the wire to break inside the covering, without the winder's knowledge. For all of these reasons efforts have been made in recent years to get rid of the silk or cotton covering.

Two methods of coil winding, both avoiding silk or cotton insulation, are well known to the art. One employs an insulating enamel on the wire, and the other a separating thread between adjacent turns of bare wire with paper insulation separating the layers. The article by Mr. H. F. Stratton in this issue sets forth the advantages of using bare aluminum wire so treated that a non-conducting film covers its surface. There is doubtless a wide field in the future for the use of aluminum in coils, if a reliable method can be found for securing the necessary insulation between adjacent wires, without the use of silk or cotton covering. Where such coverings have to be used, aluminum suffers in comparison with copper, on the score of conductivity.

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### THE LINCOLN HIGH-TENSION CASE.

Almost since the electrical art took commercial form, over a quarter century ago, certain of its branches have found their interests frequently in conflict with one another in a physical sense. Earliest of all it was learned that the single-wire ground-return type of telephone line could not comfortably inhabit the same neighborhood with that pioneer disturber of electrical calm, the single overhead trolley system of electric traction. The vagabond currents which strayed from the imperfect track returns of those days, seemingly to wander in mere haphazard fashion, and the variable-pitched note of telephone induction caused by commutation, serving so accurately to foretell the approach as well as the departure of the occasional trolley car, forced important changes in the telephone art. The transposed two-wire or metallic type of line soon took its permanent place in telephone practice and the difficulties, for a time at least, were overcome. Then came that more insidious evil, the electrolysis of underground metal structures such as water and gas pipes and cable sheaths, chargeable again to the seemingly homeless currents which disdained the track return and roamed unchecked through subterranean courses. But here no simple remedy or change in practice could be found to render the pipe systems immune or the offending currents innocuous, and the treatment has been in the direction of prevention rather than cure. Generally speaking, it has been necessary to level out the potential differences in the track system and approach the condition of an equipotential plane at zero pressure, thus treating the problem from the railway side.

Contemporaneously the alternating-current system of energy transmission and distribution came rapidly into use, early giving rise to the annoyance of induction in telephone lines from parallel distribution circuits of the familiar constant-potential and constant-current types. The difficulties were relieved at first by transpositions in the telephone circuits and later by improvements in the construction of distribution systems tending to minimize the stray fields. The later adoption of alternating-current systems of traction, particularly the single-phase system which has almost exclusively dominated American installations, brought to the front by far the most serious induction problem yet encountered, and one still lacking a fully adequate remedy from the telephone and telegraph standpoint. The latest issue created between two major branches of the electrical art is one purely of hazard, arising from the exposure of telephone, telegraph or similar low-tension systems to the high-tension, high-energy transmission systems which are multiplying so rapidly. The dangers are well recognized and an important step toward establishing safe practice was accomplished in the joint committee work which evolved the regulations set forth in the report of the overhead line construction committee of the N. E. L. A. published last year.

The court opinion in what is probably the first important test case involving the sole question of hazard to low-tension communication lines from exposure to high-tension transmission lines, the so-called Lincoln case, is abstracted elsewhere in this issue. The dangerous situation created in this instance was severely condemned by some of the leading electrical engineers who themselves have been foremost in advancing the art of high-tension transmission. While the complainants without doubt displayed tactical wisdom in demanding adequate protection in general, without insisting on specific measures, good engineering practice requires complete separation of the two systems. The National Electrical Code has for some time recognized the urgent need of separating such systems wherever possible. The 1911 edition of the code, under Rule 13, is very explicit on this point. Transmission lines of this character ought always to be on private right-of-way, and never on the public streets of cities or towns. Precedents for such practice had been established in nearby cities and towns, even villages, of Illinois and the necessity for contests of this sort ought now to be past.

## RATE RESEARCH CONFERENCE.

At the recent meeting of the rate research committee of the National Electric Light Association at Association Island there were present Mr. James C. De Long, chairman, and Mr. C. H. B. Chapin, secretary, of the committee on gas and electric schedules of the Second Public Service District of New York State. The recommendations of the two committees in relation to uniform schedules were considered, and Secretary Norton, of the N. E. L. A. committee, was instructed to advise the Second District Public Service Commission that inasmuch as the report of the N. E. L. A. committee was, to a large extent, based upon the report of the Second District committee, and since the two reports are in such substantial agreement, the N. E. L. A. committee believes that no advantage will be gained by the Second District committee waiting for further agreement before making a year's trial of the recommendations as proposed by that committee.

Recommendations for uniform schedules were further considered, and Secretary Norton was instructed to print and send out to all of the member company assistants blank sheets and suggestions for the filing of schedules in the form recommended by the committee in its 1912 report. Plans for printing the *Bulletin* beginning with the issue of Oct. 2, 1912, were discussed, and it was decided that the edition should consist of sixteen pages weekly and that a general subscription price should be charged.

## PASSAGE OF BILL REGULATING WIRELESS COMMUNICATION.

On Aug. 16 President Taft approved the Bourne bill (S. 6412) regulating radio-communication. This act requires every person, company or corporation within the jurisdiction of the United States operating any apparatus for commercial radio-communication among the several states or with foreign nations to obtain a license from the Secretary of Commerce and Labor. Every license shall be in such form as the Secretary shall determine and shall state the restrictions under which it is issued, including the wave-lengths authorized for use by the station for the prevention of interference and the hours for which the station is licensed for operation. All commercial wireless apparatus while in use shall be under the supervision of the Secretary of Commerce and Labor.

The act provides that the normal sending and receiving wave of each station shall have a definite length, either not exceeding 600 m or exceeding 1600 m. All ship stations, and all coast stations open to general public service, shall be prepared to use two sending wave-lengths, one of 300 m and one of 600 m. If the transmitted wave be not pure, the energy of any minor component shall not exceed 10 per cent of the energy of the major component. The logarithmic decrement per complete oscillation shall not exceed 2 per cent except when sending distress signals. The international distress signal shall be three dots, three dashes and three dots, and such signals shall have superior right of way.

Whenever possible every shipboard station must be prepared to send distress signals over a distance of at least 100 nautical miles by day. Shipboard stations when within 15 nautical miles of a naval or military station shall not use a transformer input exceeding 1 kw, and when within 5 nautical miles the input shall not exceed ½ kw, except for distress signals. In general, wireless stations must not use more energy for transmission than is necessary. Shipboard stations in general shall transmit their radiograms to the nearest shore station. Every operator is required to preserve with secrecy all radiograms he may receive or transmit and penalties are provided for a violation of any of the regulations contained in the new act. This act was passed by the House of Representatives on Aug. 9 and was apparently enacted without any consideration of the wireless convention signed at London by the delegates of some thirty nations early in the month of July.

## ELECTRICAL SUPPLY JOBBERS' MEETING.

The quarterly meeting of the Electrical Supply Jobbers' Association was held at the Hotel Clifton, Niagara Falls, Canada, Aug. 14, 15 and 16. These gatherings are always the means of bringing into closer harmony and co-operation the men engaged in this branch of the electrical industry. Discussions on various matters of moment to the dealers, such as selling campaigns, comparative store expenses, etc., are carried on.

At this meeting a proposition was made to the association to contribute $5,000 toward a campaign of co-operation with other electrical associations and the matter was taken under advisement. It was decided to increase the membership fee. The next meeting will be held at Hot Springs, Va., in November.

## EXTENSIONS IN AND NEAR MINNEAPOLIS.

Coincident with the announcement that on Aug. 1 active management of the Minneapolis General Electric Company was assumed by Messrs. H. M. Byllesby & Company, Chicago, announcement was also made that the firm will proceed to develop 35,000 hp on the St. Croix River above the present 20,000-hp installation at Taylor's Falls, which latter will be augmented by the installation of a 5000-hp unit. Further hydroelectric development on the Mississippi approximating 80,000 hp is under contemplation, so that not less than 160,000 hp, including several smaller developments in the region, will be available at Minneapolis. The firm's properties in Minneapolis and St. Paul will be connected by transmission lines and the water-powers of the Consumers' Power Company at Canon Falls and Mankato will be tied by a line running south from St. Paul. As announced last week, General George H. Harries will have general supervision of the Minneapolis company.

## NEW PATENT BILLS.

Two new bills amending the patent laws were introduced in the House of Representatives on Aug. 8 by Representative Harrison, of New York. Bill H. R. 26,184 provides for an amendment of Section 4884 of the Revised Statutes, the particular feature of which is given by the following quotation:

"But a subordinate property in the grant, right and property covered by every patent issued after Sept. 1, 1912, and by every extension of a patent issued after that date, may be taken, upon making just compensation therefor, for public use, by exploitation, through proceedings in equity duly instituted and prosecuted according to law and the rules and practice of the appropriate district court of the United States by the government of the United States, or by the owner of a basic patent covering a correlated invention or discovery, or by the owner of a patent covering an improvement thereon."

Bill H. R. 26,185 provides for the exercise of the right of eminent domain in compelling the owner of a patent under which the patented article or thing is suppressed from public use to grant a license. The applicant for license, in cases where the owner of the patent has refused a fair offer, must bring equity proceedings in the district court and prove that it is his intention, in good faith, to exploit the patent. Furthermore, the applicant must certify

that he will pay the compensation therefor which the court may determine. The five sections of this bill practically prescribe the equity proceedings referred to in the first bill, in the quotation given above. These bills have been referred to the committee on patents.

## PROPOSED MARCONI WIRELESS CONTRACT WITH THE BRITISH GOVERNMENT.

The negotiations which have been carried on between the Marconi Wireless Telegraph Company of America and the British government have resulted in a form of contract which was recently placed before the House of Commons for ratification. The company agrees to erect stations capable of communication over a range of at least 2000 miles in England, Cyprus, Arden, South Africa, India and other places as required and agreed upon. Complete wireless apparatus for duplex working and high-speed automatic working will be provided by the company, with earth connections and duplicate power plants at each station, for the sum of $290,000 per station. If successful working has been established at the end of six months, the company shall turn over the stations for operation by the governments concerned. The agreement shall extend for twenty-eight years after the completion of the first five stations and is terminable at the end of eighteen years by six months' notice from the Postmaster General. The company is to receive royalties of 10 per cent of the gross receipts of the stations. Favorable comment on the scheme appeared in the London *Economist*. The contract will be acted upon at the autumn session of Parliament.

## PATENT OFFICE INVESTIGATION.

The joint resolution providing for an investigation of the Patent Office, announced in our issue of July 27, was passed by the House of Representatives several weeks ago and was approved by the Senate on Aug. 15. This measure authorizes the economy and efficiency commission to conduct a thorough examination into the administration of the Patent Office and appropriates therefor the sum of $10,000. The commission is directed to report to Congress not later than Dec. 10 what changes in law, appropriations and additional building accommodations are necessary. Mr. F. A. Cleveland is chairman of the commission. It is announced that hearings will be held during the course of the investigation.

## GEORGIA SECTION, N. E. L. A.

At the opening session of the second annual convention of the Georgia Section of the National Electric Light Association, held in Tybee, Ga., on Aug. 15, 16 and 17, the address of welcome was delivered by the Hon. W. W. Osborne, Savannah, the meetings being in charge of Mr. William R. Collier, Atlanta, president of the section.

### ELECTRIC VEHICLES.

A paper entitled "The Present Status of Electric Vehicles in the Southeastern States" was presented by Mr. A. N. Bentley, Electric Storage Battery Company, Atlanta. The author stated that the Georgia Railway & Power Company operates four commercial vehicles. The company's battery expert makes regular inspection of many electric vehicles housed in private garages. The work of this man has resulted in a rapidly increasing popularity of the electric vehicle in Atlanta. About eighty electric pleasure vehicles and eight commercial cars have been placed in operation in Atlanta during the past two years.

The Memphis Consolidated Gas & Electric Company last fall opened a garage, in its own name and under its own management, exclusively for electric vehicles. Nine commercial cars and fifty pleasure cars have been placed in service in Memphis since the opening of this garage, the number of cars being doubled in less than one year.

The author stated that central stations in other places should exert every effort to encourage the use of electric vehicles in their localities, since each station obtains an income of from $5 to $50 per month from every electric vehicle taking energy from its system. Moreover, the load is of the most desirable off-peak character.

Mr. Bentley's paper was discussed by Messrs. Thomas W. Peters, Columbus Electric Company; E. C. Deal, Georgia Railway & Power Company, Atlanta; John S. Bleecker, Columbus Electric Company; Marcy L. Sperry, Savannah Electric Company; E. S. Roberts, Savannah Electric Company, and J. Watterson. Mr. Peters stated that a mercury-arc rectifier was installed in Columbus for at least two years before there was any need for it in charging vehicle batteries. The electric company has attempted to create a demand for electric vehicles, but has met with no success. Mr. Watterson called attention to the work accomplished by the Public Service Corporation of New Jersey. This company employs a consulting engineer who spends his time in inducing horse owners to substitute electric vehicles for their present equipment. There are now used in New Jersey about 300 more vehicles than were in use before this plan was inaugurated.

Mr. Bleecker explained that recently an electric garage has been opened in Columbus and an active electric-vehicle campaign is now under way.

Mr. Deal remarked that the lack of confidence in the electric vehicle on the part of central stations has been the prime cause for the slow introduction of the vehicle. The time has arrived when central stations can consistently use electric vehicles and recommend them to their customers and friends. Central-station companies can safely assume practically all responsibility and reasonable expense connected with the operation of an electric vehicle for several months after it is sold.

Mr. Sperry said that the Savannah Electric Company now believes that it cannot get along without electric vehicles, the only real problem being to determine how many should be used.

President Collier called attention to the return to the electric vehicle of the Birmingham Railway, Light & Power Company, which abandoned its electric-truck service several years ago on account of poor results.

### SYNCHRONOUS CONDENSERS.

Mr. H. E. Bussey, General Electric Company, Atlanta, presented a paper outlining the operating characteristics of an over-excited, under-loaded synchronous motor and explained the manner in which it may be employed for counteracting the effect of lagging wattless volt-amperes demanded by inductive loads on an alternating-current system. He showed that the use of the so-called "synchronous condenser" will sometimes obviate the necessity for additional generator equipment and again may eliminate complaints of bad voltage regulation. The distribution system is benefited to the extent of better service to consumers with the same equipment and the same load, or the power producer derives the benefit for an increased energy distribution without increase in outlay for lines, transformers, etc.

The paper of Mr. Bussey was discussed by Messrs. G. K. Hutchins, Columbus; M. L. Sperry, Savannah, and the author. Mr. Hutchins remarked that as a result of a clause in the contracts of the Columbus Electric Company according to which a customer is charged on the basis of kva-hours instead of kw-hours when his load power-factor is below 90 per cent, many of the large customers now install synchronous condensers in the step-down transformer rooms.

Mr. Sperry stated that the Savannah Electric Company plans to install synchronous motor-generator sets in its railway and lighting substation in order to be able to maintain a satisfactory power-factor on the system.

Mr. Bussey explained that it is advantageous to install synchronous condensers near the end of the alternating-current lines rather than in the generating station, on account of the improvement in voltage regulation and the decrease in line current.

MOTOR-SERVICE DATA.

Mr. H. L. Wills, Savannah, on behalf of the power committee called attention to the desirability of collecting data on the energy cost of operating various mills and factories. Mr. G. K. Hutchins, Columbus, explained that it is highly desirable to be able to state to a prospective customer just how much energy will be needed to produce, say, a ton of phosphate or operate a thousand spindles. Mr. Thomas W. Peters, Columbus, remarked that the Commercial Section of the N. E. L. A. is collecting and distributing much of just such information. Messrs. J. S. Bleecker and W. R. Collier suggested that the power committee of the Georgia Section co-operate with the Commercial Section of the N. E. L. A. in order to supplement but not duplicate the work of the latter section.

PREPAYMENT METERS.

"A Mechanical Collector; Its Offenses and Defenses" was the title of a paper by Mr. Thomas W. Peters, Columbus. The author outlined the disadvantages of the prepayment watt-hour meter and explained the conditions under which it may be used advantageously. He stated that this meter has enabled his company to secure certain classes of customers, including mill operators and negroes. These customers use light in the morning as well as at night. The average house installation is about four 16-cp equivalents.

The paper was discussed by Messrs. E. C. Deal, Augusta; W. R. Collier; G. S. Merrill, Cleveland, Ohio; J. S. Bleecker, Columbus; E. S. Roberts, Savannah, and the author. Mr. Deal remarked that he had been unable to convince himself that the prepayment meter was a necessity in the electric service business. There is a real demand, however, he said, for a cheaper watt-hour meter and maximum controlling devices for small consumers. He expressed doubt as to any advantages possessed by the prepayment meter over the maximum controlling device for small consumers.

Mr. Merrill claimed that the flat-rate controlling device has proved very satisfactory for the average householder; it eliminates the expense of a meter reader and permits the use of a fixed charge. Moreover, it is an inexpensive device and seems much preferable to the prepayment meter.

Mr. Peters remarked that he prefers the prepayment meter to the maximum controlling device because he does not believe in flat-rate service.

Mr. Bleecker said that in Columbus about 10 per cent of the electric meters and 40 per cent of the gas meters are of the prepayment type.

Mr. Roberts claimed that the company should take pains to explain that the prepayment meter is used at the request of the public and not to designate poor-pay customers.

ARC-LAMP DEVELOPMENTS.

Some of the recent developments in arc lamps were described in a paper by Mr. L. A. S. Wood, Westinghouse Electric & Manufacturing Company, Pittsburgh. The development of the arc lamp was treated under five separate heads, the open carbon lamp, the inclosed carbon lamp, the metallic-flame lamp, the open-flame carbon lamp and the inclosed-flame lamp. The author claimed that the most satisfactory and economical of the lamps is the inclosed-flame carbon. In this lamp superimposed carbon electrodes feed together simultaneously so that the arc is maintained in a fixed position. On account of the peculiar shape of the globe the lower portion remains comparatively cool and forms the lower condensing chamber, while the upper portion of the globe adjacent to the arc becomes very hot. The lighter fumes are carried by the rising currents of air into the upper condenser, leaving the upper section of the globe or arc chamber through which the light is emitted perfectly clean and clear. The lamp gives a maximum candle-power of from 2500 to 3000 candles. The specific consumption varies from 0.25 watt to 0.40 watt per mean lower hemispherical candle-power.

In the discussion of Mr. Wood's paper, which was participated in by Messrs. G. S. Merrill, Cleveland, Ohio; E. C. Deal, Augusta; M. H. Hendee, Augusta, and the author, it was pointed out that in comparing various types of lamps it is necessary to consider depreciation of candle-power during service, power-factors and the adaptability of the unit to service requirements. Mr. Hendee related experience in Augusta where arc lamps installed on the recommendation of the manufacturer to give four times as much light as the older types proved unsatisfactory to the city officials.

PURCHASING COAL ON THE HEAT-UNIT BASIS.

The desirability of purchasing coal on the heat-unit basis was discussed briefly in a paper by Mr. Marcy L. Sperry, Savannah Electric Company. The author said that virtually all supplies used by manufacturers are bought under a quality guarantee, and there is no equitable reason why the 500,000,000 tons of coal used in the United States yearly should not also be thus guaranteed as to quality.

Messrs. J. T. Chambers, Georgia Railway & Electric Company, Atlanta, and H. L. Wills, Savannah Lighting Company, commented on the paper. Mr. Chambers expressed the opinion that in the near future all users of large quantities of coal will buy on the heat-unit basis. Mr. Wills claimed that an effort should be made to determine the desirable chemical contents of coal to give the best results in the station under investigation.

ELECTRIC RATES.

Mr. S. G. Merrill, National Electric Lamp Association, Cleveland, Ohio, read a paper in which were discussed the necessity for variation in the rate per kw-hour according to the character of the load and the methods for determining the rate to be charged. The author stated that experience has shown that for large commercial and industrial customers the two-charge block rate making separate fixed and running charges is simple, equitable and satisfactory.

For the small customer the multiple rate has been found uniformly satisfactory and well designed to develop profitable, long-hour use of service. In spite of the complicated method by which some multiple rates have determined the primary consumption they have been introduced with but little trouble. By the use of floor area or number of rooms the multiple rate can be made both simple and equitable, and in view of the ease with which the more complicated forms have been adopted in the past there should be little reason for criticising such rates as being too complex for the ordinary service. Simplified by the use of illuminated area, the many advantages of the multiple rate over the straight meter rate should lead to its greatly extended adoption.

For the very small customers the controlled demand rate offers great opportunity of business development, particularly because of the great number of very small prospective customers within easy reach of the present lines.

The paper by Mr. Merrill was discussed briefly by Mr. J. S. Bleecker, Columbus, who claimed that in formulating a system of charging one should consider the three factors of theory, practice and policy.

PUBLIC POLICY.

The report of the public policy committee was presented by Mr. P. S. Arkwright, Georgia Railway & Electric Com-

pany, Atlanta. This report dealt with the duty of the public to the central station company and the duty of the company to the public. Particular attention was called to the disadvantages of short-term franchises, especially under conditions in Georgia where the service and rates of the company are under the control of the railroad commission and no franchise is exclusive. A short-term franchise is disadvantageous to both the company and the public. When the company applies for a renewal every possible and impossible burden may be placed on the company, and hence the rates must be such as to insure a full return on the money invested during the short life of the original franchise.

On its part the company owes the public the duty of fair treatment, good service and reasonable rates.

DIVERSITY FACTOR.

A paper by Mr. W. L. Southwell, Central Georgia Power Company, Macon, contained an instructive treatment of diversity factor and its effect upon central station operation and economy. It was stated that fair average values for diversity factors are about 0.37 for residence lighting, 0.69 for commercial lighting and 0.70 for general motor service. These figures represent the ratio between the maximum demand recorded at a single transformer supplying energy to a group of consumers and the sum of the consumers' maxima.

OFFICERS ELECTED.

At the executive session on Aug. 17 the following officers were elected: President, Mr. E. C. Deal, general manager of the Augusta-Aiken Railway & Electric Company; vice-president, Mr. Thomas W. Peters, Columbus Electric Company; secretary-treasurer, Mr. M. H. Hendee, Augusta; executive committee, Messrs. E. S. Roberts, Savannah; C. D. Flanigan, Athens, and W. L. Southwell, Macon; chairman of membership and finance committee, Mr. Thomas W. Peters, Columbus; editor of *Proceedings*, Mr. E. C. Roberts, Savannah. It was decided to organize a Southeastern section of the association.

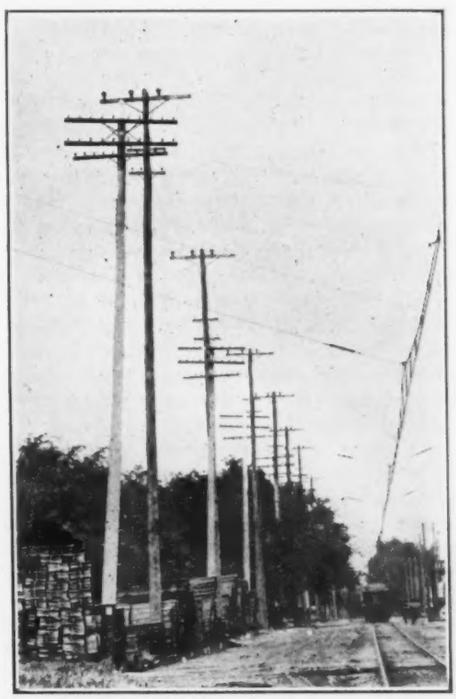
## DECISION IN THE LINCOLN HIGH-TENSION CASE.

On Aug. 8 a decision for the plaintiff was handed down in the chancery branch of the Circuit Court of Logan County, Ill., in the case of the American Telephone & Telegraph Company versus the Springfield & Northeastern Traction Company, affecting the right to overbuild a telephone or telegraph line with a parallel high-tension transmission line on the same right-of-way. The complaint grew out of a situation which arose in the city of Lincoln, Ill., during the latter part of 1907.

At that time the traction company, which is one of the numerous companies making up the Illinois Traction System, commenced to build its road through Lincoln, forming part of a continuous route from Peoria, Ill, to Springfield, Ill., and points south. The single-phase traction system was employed, with catenary construction supported from span wires and a trolley-wire pressure of 3300 volts at 25 cycles. On one of the lines of poles, at the street curb, there was carried a 33,000-volt, three-phase transmission circuit and sundry low-tension wires for signaling and communicating purposes. At the southern outskirts of the city there was a transformer substation, similar to a number of others, receiving energy over the main transmission circuit from Peoria or Riverton, Ill., or both.

For a distance of about 700 ft. on one of the principal streets the line of 65-ft. wooden poles supporting both the span wires and the high-tension circuit was set in line with the poles of the telephone company, so that the 33,000-volt line was about 14 ft. above the telephone wires and parallel to them. The traction company's poles were of chestnut set 7 ft. in the ground, surrounded by 10 in. of concrete; the butt diameter was from 12 in. to 15 in., and the top was 7 in. to 8 in. Each pole carried three 2-in. by 4-in. fir cross-arms, one 10-ft. arm for the high-tension circuit and two shorter arms for the signal and telephone circuits. The transmission wire was No. 2 B. & S. gage bare copper, tied to pin-type porcelain insulators with three and a half turns of No. 6 B. & S. gage wire. The cross-arm braces were held to the arm by bolts and to the pole by a lag screw. In several places the poles of the traction company were in contact with the wires of the telephone company. On Sept. 23, 1907, the traction company's construction in this vicinity was completed.

The telephone company on Nov. 20, 1907, served notice on the respondent that the construction was defective and dangerous and on Jan. 10, 1908, filed formal complaint. In substance the complainant averred that its telephone line had been a lawful occupant of the street in question for twelve years, under due authority of the State, county and municipality, and that this line formed part of a comprehensive telephone network used for serving the public.



**Parallel Overbuilding of Telephone Line by High-Tension Transmission Line.**

Furthermore it was averred that the transmission line constituted a serious menace to the property of the telephone company and the lives of employees and patrons and would serve its purpose equally well if constructed upon private right-of-way, removed a safe distance from other wires. Averment was also made that the trolley wire constituted a serious hazard because of the high voltage employed. The telephone company's system was alleged to operate at low tension and to constitute no hazard to the public, and it was maintained that the system was necessarily delicate and incapable of withstanding pressures much in excess of 500 volts; that the known and approved protective devices are sufficient to exclude only those currents ordinarily employed to operate street cars and incandescent lamps and unable to furnish protection against the pressures employed by the traction company; that the failure of the traction company's system in any one of numerous ways might convey dangerous currents to the telephone systems, with attendant injury to life and property. Complainant finally averred that it was the traction company's duty, in so locating its line, "to adopt and install known and approved

safeguards, methods and protective devices, which would prevent its own line, carrying such dangerous electrical current, from coming in contact with the wires or other properties of complainant; that such safeguards, methods and devices are well known in the electrical art and are accepted by those versed in the science of electricity," and that such parallel overbuilding is contrary to approved and accepted methods of construction now in use. The bill of complaint prayed, among other things, for a preliminary injunction restraining the use of the transmission and trolley circuits, later to be made permanent until the high-tension line might be removed to a safe distance and the trolley voltage reduced to a safe value, or until adequate safeguards and protection might be installed.

In its answer the traction company denied in substance the existence of danger or hazard to life and property while the line was maintained in the safe condition that then characterized it and averred that the construction in all respects complied with the franchise granted by the city of Lincoln. The respondent further denied that it had failed to use the best known methods of construction and the most approved safeguards and protective devices for preventing contact between its wires and those of the complainant, and denied that the telephone company had adopted the safeguards, methods and protective devices well known to the art and accepted by those versed in it for preventing contact between the two systems. It denied that wind, snow, sleet or storm, or interference by persons or animals, commonly caused high-tension lines constructed like those in question to fail, as charged in the complaint.

Owing to the belief of the telephone company that it had an unusually clear case involving the question of pure hazard from parallel overhead high-tension wires, the issue was made a test case. A large amount of evidence was introduced and many of the leading electrical engineers of the country testified in behalf of the complainant. By agreement the high-tension line was not energized in the section under consideration, and during the progress of the case the traction company built a short detour to the east, installing a cradle where the line, at one place only, crossed over the telephone line. Also during the trial of the case the traction company abandoned the use of the 3300-volt, single-phase traction system entirely, about the middle of 1909, and substituted everywhere the 600-volt direct-current system. The illustration shows the situation as it was originally when the action was brought.

Judge Harris in his opinion filed on Aug. 8 described both complainant and defendant as public-service corporations differing only in prior authority and occupation of street. The opinion states that the construction of the telephone line was such that the respondent could not complain of it, and from all the evidence of all the witnesses no protective device could be used in telephone construction which would safeguard it against a pressure of 33,000 volts or anything like it. After considering the question of the court's jurisdiction, the opinion goes on to state that "so far as concerns the respondent the complainant was occupying Chicago Street between Broadway and Clinton Street, not with any exclusive franchise, not with any amount of space to be measured and set off to it, but with the right as against the respondent to occupy so much of the street as was necessary for the successful operation of its business." A little further on the opinion says: "The thing to be guarded against by respondent in the construction of its line under the law, as I understand it, is such an interference as will prevent the practical operation of the telephone system."

The remainder of the opinion deals with the question of whether the respondent has so interfered with the rights of the complainant, considering alone the transmission line, that an injunction should be issued. Again the court stated that the respondent's duty was to use every reasonable safeguard to prevent accidents. Moreover, the court regarded the evidence as showing beyond dispute that with any of the construction described in the evidence accidents occur from such high-tension lines. Telephone, telegraph, electric light and power lines are not immune to decay or destruction caused by the elements. The evidence preponderated also on the proposition, in the court's judgment, that high-tension lines crossing over, under or paralleling low-tension lines introduce an element of danger which otherwise does not exist, demanding extra precautions in the way of shorter spans, extra cross-arms and the use of screens or cradles. The judge recognized that cradles impose an extra burden on the line and tend to cause other trouble, but regarded them as necessary and pointed out that they are in use even by the respondent. The opinion then concludes as follows: "Therefore I find from the evidence that the construction of the transmission line of respondent upon Chicago Street between Broadway and Clinton Street in the city of Lincoln is not the best, most approved and modern construction. While practicable, it was not necessary to the successful operation of the railroad to be so located, but located by election of respondent under lawful authority and is a right belonging to respondent which the court will not set aside or order removed provided the respondent recognizes the rights belonging to complainant, to be by respondent protected, provided and equipped with the safeguard to minimize the dangerous and hazardous conditions that now exist. Injunction will be granted as prayed for in the bill, except as modified by these conclusions."

## PUBLIC SERVICE COMMISSION NEWS.

### NEW YORK COMMISSION.

The Public Service Commission, Second District, has completed an inspection of twenty of the twenty-six central offices of the New York Telephone Company in Manhattan, which serve 327,840 subscribers, or about 78 per cent of the total number of subscribers within this main section of Greater New York. Public opinion concerning the service was carefully canvassed, and considerable complaint was made by the users in some sections. Most of this adverse criticism was on account of getting wrong numbers and being subjected to "cut-offs." No complaint was registered concerning the speed of the service nor concerning line and instrument troubles.

The commission's inspectors examined the equipment and central-office methods thoroughly and made record of over 2500 test calls from subscribers' stations and the company's central offices. The average speed of first answer by operators was found to be a fraction above five seconds. Special attention was given to the causes for the defective service which caused complaint, and the inspectors' reports call the telephone company's attention to specific cases where there was found to be an overload and where there was a shortage of operators or too high a percentage of inexperienced operators. These matters have since been taken up in informal conference with the officers of the telephone company with the result of effecting a number of changes which will tend to improve the service. It is the intention to have these inspections continued and proper remedies applied wherever found necessary.

The commission has made an order requiring the Port Jefferson Electric Light Company and the New York Telephone Company to show cause before the commission on Monday, Aug. 26, why an order should not be entered against each of them requiring them to place their respective plants in safe and proper condition. A report on conditions at Port Jefferson was made by an engineer of the commission and both companies were asked to advise what they would do under the circumstances, but neither company has made satisfactory answer.

The commission has inaugurated a system of cross-checking telegraph messages with a view to ascertaining the character of the service rendered. An outline of the method used was sent to the Postal Telegraph-Cable Company and the Western Union Telegraph Company for their comment. Both companies replied that the method was excellent and that they would appreciate any records which the commission makes in cross-checking.

At a recent inspection of the Western Union office at Elmira a cross-checking record of fifteen messages was made, which appeared to show that attention should be given to the transmission of messages destined for Elmira. The Western Union company informed the commission that this service had been materially improved by the employment of an additional operator at Elmira, action which had been taken on the recommendation of its own traffic inspectors, who had detected the cause of the delays prior to the receipt of the commission's cross-checking report.

OHIO COMMISSION.

The commission has received a request for permission to sell the Standard Light & Power Company to Mr. Field W. Swezey, representing the American Gas & Electric Company of New York, which now operates plants in Canton, Newark, Tiffin and Fremont. Negotiations have recently been closed for the sale of plants at Lancaster and Mount Vernon to the same company. The control of the Mount Vernon property is in the hands of Mr. N. C. L. Kachelmacher. It operates the Mount Vernon street railway lines and a short interurban line, as well as the light and power plant, which is practically new, having been in operation but a short time.

# Current News and Notes

DEFEAT OF IRON AND STEEL TARIFF BILL.—On Aug. 16 the iron and steel tariff bill, passed over the President's veto by the House of Representatives, was finally defeated in the Senate.

* * *

WORLD-WIDE NAVAL WIRELESS SYSTEM.—The naval appropriation bill now pending in Congress provides, among other things, for the establishment of a world-wide telegraph system through which the Navy Department will be enabled to keep in touch with its ships in virtually every part of the globe.

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ARTIFICIAL DAYLIGHT.—Dr. C. E. Kenneth Mees on Aug. 20 delivered a lecture before the Illuminating Engineering Society of England on producing in artificial light the exact qualities of daylight. Dr. Voege contributed on the same occasion an elaborate discussion on his color studies with artificial illuminants.

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WESTERN ELECTRICAL INSPECTORS.—Mr. James H. Fenton, Pierce Building, St. Louis, Mo., is the committee on arrangements for the annual convention of the Western Association of Electrical Inspectors, which is to be held in St. Louis Jan. 29 and 30, 1913. Mr. William S. Boyd, 76 West Monroe Street, Chicago, Ill., is the secretary of the organization.

* * *

COOSA RIVER DAM.—The Senate passed a bill on Aug. 16 authorizing the construction of a dam across the Coosa River, Alabama, for water-power purposes. Senator Poindexter offered an amendment providing for a tax of 1 per cent on the net earnings of the grantee, but this proposition was voted down. The measure has been sent to the House of Representatives.

* * *

POSTAL COMPANY BUILDING TOLL LINE.—The Postal Telegraph Cable Company secured an amendment of its charter in Kentucky whereby authority is given it to operate telephone systems. It is building such a line from Maysville, Ky., to Huntington, W. Va. This move is in harmony with the general policy of entering the telephone field which the Postal company announced some time ago, as stated in the *Electrical World* of June 15, 1911, page 1538.

* * *

STRIKE OF TELEPHONE SUBSCRIBERS.—A unique method of protesting against the poor service rendered by a telephone company is reported from Checotah, Okla., where, it is said, all the subscribers in the town took down the receivers from their telephones and left them off in order to make the system as a whole inoperative. The citizens of Checotah are said to have asserted that they will not permit the telephones to be used until improvements in the service are made.

* * *

PRODUCTION OF FOG BY STATIC DISCHARGES IN THE ARCTIC REGION.—On some of the moving-picture films obtained by Captain F. E. Kleinschmidt, of the Carnegie Museum expedition to Alaska and Siberia, peculiar and recurring fog marks were observed and for a time challenged explanation. Finally it was discovered that in the intense, dry cold of the Arctic climate static electricity was generated on the rapidly moving film and this, in discharging between metal points of the mechanism, caused the fog marks noted.

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HIGH WATER IN SOUTHWESTERN MICHIGAN.—During an exceptionally severe electrical storm on Aug. 17 and 18, 14 in. of water fell in twenty-four hours in Berrien County, Michigan, which forms the southwestern corner of that State. A great deal of damage was done to property and at least two persons were killed by lightning. A number of dams in rivers were carried away or damaged, and the hydroelectric plants of the Indiana & Michigan Electric Company at Buchanan, Mich., Berrien Springs, Mich., and South Bend, Ind., were considerably damaged.

* * *

NEW MEETING PLACE FOR ELECTRIC CLUB OF CHICAGO.—It is probable that future meetings of the Electric Club of Chicago will be held in the Hotel Sherman instead of the restaurant of the Kuntz-Remmler Company, on South Wabash Avenue, where the weekly meetings have been held for some time past. The new location, at the corner of North Clark Street and West Randolph Street, is selected as more convenient of access to the majority of the members. The first meeting of the fall season will be held at 12:15 p. m. on Sept. 12.

* * *

TRAIN ACCIDENT STATISTICS.—In a bulletin issued by the Interstate Commerce Commission on train accidents during January, February and March, 1912, it is shown that 267 passengers were killed and 4785 injured, an increase of 121 killed and 1555 injured compared with same months in 1911. On electric lines five persons were killed and 403 injured. For this quarter, the commission says, it is shown that train accidents are the largest in number of casualties and in amount of financial loss since 1907, when the high-water mark in railroad casualties was reached.

* * *

PLATINUM PRODUCTION.—The world's production of platinum was 314,323 Troy ounces in 1911, compared with 286,952 ounces in 1910. All of the platinum mined in the United States in 1911 came from California and Oregon, the total being 628 ounces, valued at $18,138. According to Mr. Waldemar Lindgren, of the United States Geological Survey, the platinum imported and entered for consumption in the United States in 1911, including ores and manufactured products, was valued at $4,866,207, an increase over the 1910 figures of $1,212,543. The exports amounted to only $8,139.

Compilation of Public Utility Laws.—The department on regulation of utilities of the National Civic Federation, Mr. Emerson McMillin, chairman, and Mr. John H. Gray, director of investigation, has nearly ready a compilation and analysis of public-utility regulation laws of the United States. This analysis will be prepared in fifteen parts and will be printed and distributed to interested persons, subject to subsequent additions, deductions and alterations. Preliminary page proofs of the section on "The Regulation of Accounts" have just been distributed, and suggestions and criticisms are invited. The headquarters of the federation are at 1 Madison Avenue, New York, N. Y.

* * *

Fire in Indianapolis Telephone Exchange.—On Thursday, Aug. 15, a fire started in the terminal room of the central office of the Indianapolis Telephone Company and caused a total interruption of both local and toll service. The fire was evidently due primarily to dampness which had entered the cable forms on the switchboard side of the cross-connecting rack, and the ringing current employed by the operators in signaling subscribers probably started an arc, thereby igniting the insulation. The cables on both sides of the rack were badly damaged. The company reports that repairs are progressing very rapidly and that it expects to have service restored within a week or ten days.

* * *

Angling with a Trolley-Wire Fishing Pole.—The sale of large quantities of fish by dealers and peddlers in Lafayette, Ind., recently attracted the attention of the fish and game warden of Tippecanoe County, who, after investigation, assured himself that no seines or nets were in use in his district. Setting out to ascertain the source of the unusual supply of fish, he discovered two men near an interurban railway bridge, one of whom from time to time indulged in the extraordinary practice of striking his fishing pole against the trolley wire, after which the other would gather in a boatload of the dead and stunned fish which floated to the surface. Investigation showed that an insulated wire ran down the fish pole and dipped into the water under the bridge. The 500-volt contact with the trolley served to electrocute all fish near the wire, killing them outright, it is declared, instead of stunning them as in the case of dynamiting.

* * *

Charging Stations for Electric Automobiles.—The touring department of the Automobile Club of America is taking steps to have charging stations for electric automobiles established at convenient points in New York State along the roads between New York, Poughkeepsie, Schenectady, Amsterdam, Utica, Rochester and Buffalo, giving electric vehicles a touring radius of 40 miles. The bureau is also taking up the matter of creating available routes throughout the southern tier of counties. It is pointed out that charging stations must be established before business can be obtained. A good example is found in the city of Rochester, N. Y., where the number of electric pleasure vehicles has increased in a few years to 720, owing largely to the existence of adequate charging facilities. On the other hand, the city of Albany, N. Y., which is said to have no charging facilities, has less than six pleasure cars of this type. In this connection, however, it may be recalled that Albany is a city of steep hills.

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## SOCIETY MEETINGS.

Engineer Draftsmen Meeting.—At a meeting of the American Society of Engineer Draftsmen held in the Engineering Societies Building on Aug. 15 Mr. W. T. Walters, Chicago, presented a paper on the application and design of safety devices. A visit was made during the evening to the American Museum of Safety, which adjoins the society's meeting room. The secretary of the society is Mr. Walter M. Smyth, 116 Nassau Street, New York.

* * *

Annual Outing of New York Companies Section, N. E. L. A.—The second annual outing of the New York Companies Section of the N. E. L. A. will be held on Saturday, Sept. 14, at Donnelly's Grove, College Point, L. I. Athletic games and sports will fill the afternoon program, after which dinner will be served. The price of tickets, including dinner, will be $1.50. Mr. Clarence L. Law is chairman of the tickets and notices committee, and Mr. J. E. Phillips is chairman of the general committee.

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Eastern New York Section, N. E. L. A.—At the third annual meeting of the Eastern New York Section, N. E. L. A., held at Trenton Falls, N. Y., the following officers were elected for the ensuing year: President, Mr. A. T. Throop; vice-president, Mr. A. Anderson, of the Municipal Gas Company, Albany; secretary, Mr. R. E. Russell, General Electric Company, Schenectady; treasurer, Mr. F. W. McRae, Adirondack Power Corporation, Glens Falls. The executive committee is composed of the officers and the following additional members: Mr. H. W. Peck, Schenectady Illuminating Company; Mr. L. W. Emerick, Fulton Light, Heat & Power Company; Mr. O. F. Webster, Westinghouse Manufacturing Company, Syracuse; Mr. J. Shreck, of the Central Hudson Gas & Electric Company, Poughkeepsie; Mr. J. T. Mange, of the Ithaca Electric Light & Power Company, and Mr. C. W. Stone, of the General Electric Company, Schenectady. Dr. William B. Coolidge, assistant director of the research laboratory of the General Electric Company, read a paper entitled "Some Contributions of the Research Laboratory to the Development of the Electrical Industry." A paper by Mr. W. B. Underwood on "Heating for Increasing the Central-Station Load" and one by Mr. E. P. Edwards on "Electricity as a Factor in Progressive Agriculture" were read and discussed.

* * *

Outing Meeting of Wisconsin Electrical Contractors.—The ninth summer meeting of the Electrical Contractors' Association of Wisconsin was held on Aug. 15, 16 and 17. Members with their wives assembled in Oshkosh on the evening of Aug. 14 at the Athearn Hotel for an informal dinner. On the following morning all hands went aboard the small steamer *Mayflower*, which was chartered for the occasion, bound for New London, lunch at noon being served aboard. Owing to several mishaps, New London was not reached until 8:30 p. m., more than two hours late. Ordinarily this would not have made any material difference, but no preparation had been made for supper aboard. A little "persuasive" engineering induced the proprietor of the Elwood to serve supper to almost a score of belated and hungry mortals. Next morning the steamer was again boarded, bound for Gill's Landing, from which point the train was taken for Waupaca, the members continuing by trolley to the Chain of Lakes, which was the original destination, the side trip to New London not having been included in the original program. After luncheon a launch trip covering the Chain of Lakes was in order. This was keenly enjoyed by all, and after again landing on terra firma the business session was held, routine matters mainly being transacted. At 10 a. m. on Saturday the trolley cars were again boarded for Waupaca, the members continuing by train to their respective homes. Among those present were Messrs. and Mmes. J. L. Acker, Sheboygan; A. C. Langstadt, Appleton; William F. Meter and Christopher Saran, Oshkosh; George F. Rohn, Herman Andrae, George Knoerr and Albert Petermann, Milwaukee, and Mr. J. D. Warden, Sheboygan.

# PENNSYLVANIA WATER & POWER COMPANY

## Hydroelectric Generating Station on the Susquehanna River and Terminal Station at Baltimore, Md.

### Steel-Tower Transmission Lines for 70,000-Volt Circuits Equipped with Suspension-Type Insulators—Features of Development Near McCall Ferry—Transmitted Energy Used for Railway, Lighting and Industrial Service in Baltimore.

THE hydroelectric development of the Pennsylvania Water & Power Company is located on the Susquehanna River at Holtwood, Pa., about 10 miles northwest of the boundary line between Pennsylvania and Maryland and 40 miles from Baltimore. There are steep banks on either side of the river at McCall Ferry with an island in midstream, and a narrow gorge between the eastern bank and a chain of islands forms a natural tail-race. A fall in the river, due to a series of rapids above the site, makes available for hydraulic purposes a total head of about 63 ft.

The Susquehanna River is subject to extremely high fluctuations, the floods coming with remarkable suddenness and the maximum flood discharge being roughly 225 times the minimum stream flow. For that reason a dam has been built with a spillway section for its entire length of 2350 ft. The completed plant is laid out with the idea of having its operation unaffected by flood and ice conditions more severe than any that have even been experienced on the Susquehanna. Just above the plant there is a bend in the river which causes the ice to be carried almost entirely through the channel on the western side, the normal flow of the river being westward.

#### DAM AND FOREBAY.

The dam across the river is built of solid concrete with an average height of 55 ft. and a width at the base of 65 ft. The downstream face is provided with the usual curve, and to allow for expansion and contraction layers of compressible material are introduced at intervals of 40 ft. The dam impounds a body of water forming a lake above it about 8 miles in length, and in order to protect itself against claims for flooding property along the river, the company acquired large tracts of land on both sides of the Susquehanna adjoining the lake thus formed. In addition a wing dam having three submerged arches, through which the water enters the forebay, is built at right angles to the

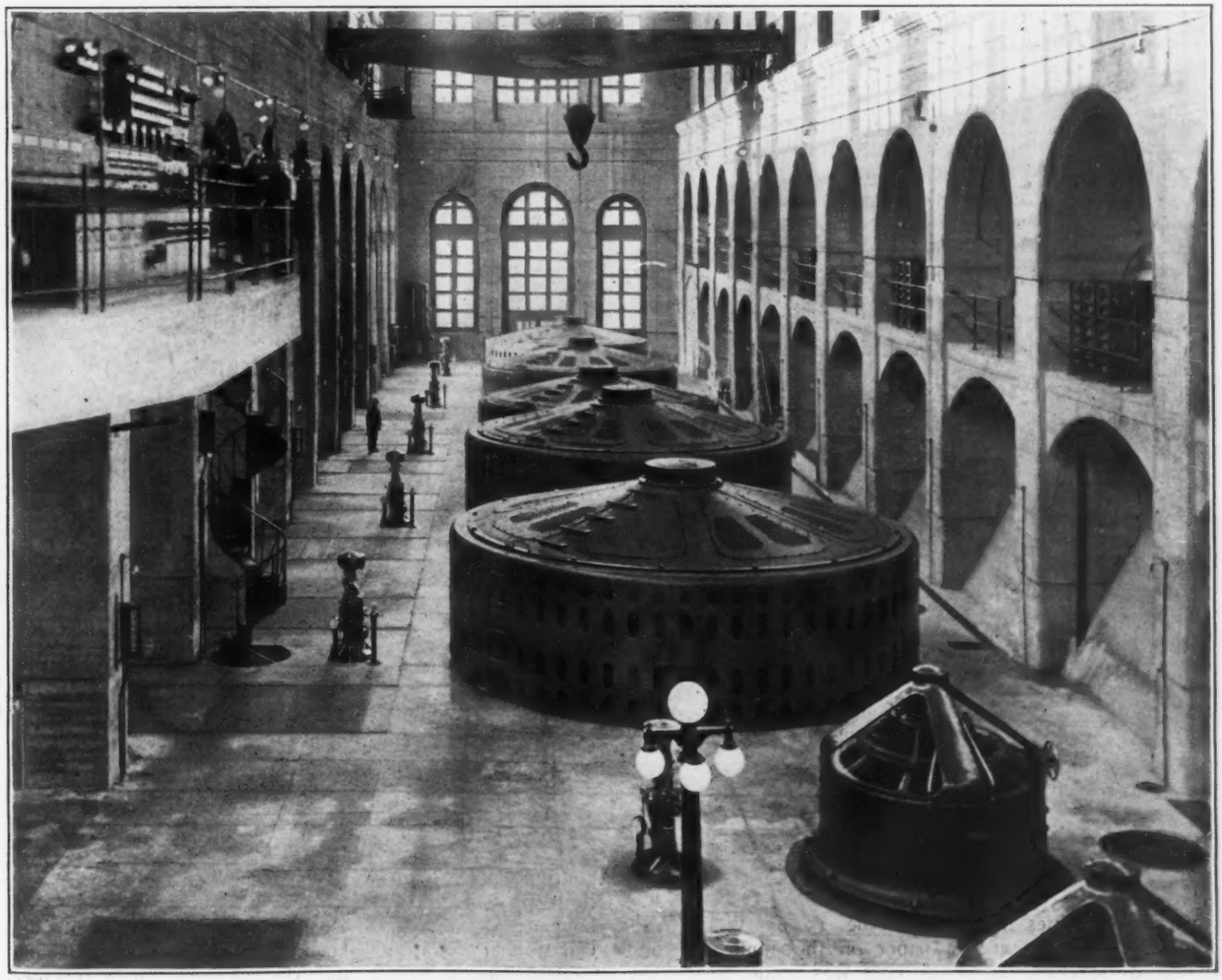


Fig. 1—Generating Equipment of the Pennsylvania Water & Power Company at Holtwood, Pa.

main dam, between which and a rock fill extending out for approximately 300 ft. at right angles to the shore floating booms are provided so as to divert such ice and debris as are carried to the east over the spillway. The submerged arches start at the junction of the power house and the dam and extend upstream about 220 ft. The crowns of the arches are 2 ft. below low-water level, so that they are always submerged. The gap between the end of the arch construction and the rock embankment is closed by the log booms above mentioned, guided by concrete piers. Any ice which enters the forebay despite these safeguards, as well as ice which may be formed there, is diverted through ice chutes placed between the power house and the shore, with crests at the same elevation as the crest of the main spillway.

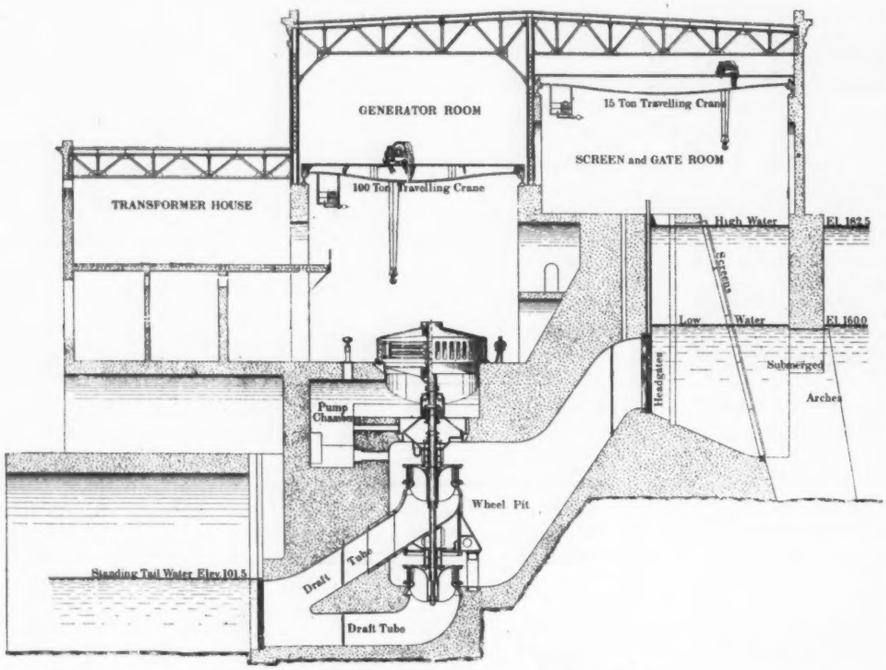



Fig. 2—Sectional Elevation of Generating Station.

GATEHOUSE.

The gatehouse is divided from the forebay proper by the line of submerged arches, which also form the support for the upstream wall of the building. Immediately back of these arches are the trash racks, on inclined concrete piers 10 ft. between centers. These piers have a maximum thickness of 4 ft., so that the waterways between them are 6 ft. wide. There are four of these entrances, each 16 ft. high, serving each turbine, and the four merge in one huge tube 30 ft. wide at a point 8 ft. back of the headgate.

The headgates are of the roller type of special design, permitting quick and easy operation. The gates are made up entirely of steel, with the exception of the wooden bottom bumper beam, and move on rollers of gray iron 9 in. in diameter turning around brass bushings. The rollers are greased from the centers of the bearings by pressing fat through the roller axle. Located longitudinally over the gates is a 5-in. motor-driven shaft made up of 20-ft. lengths, connected alternately by standard flange couplings and placed so that vertical racks on the gate stems engage on the shaft. The shaft runs through the entire length of the gatehouse and is capable of lifting the four gates of one unit together under normal water conditions in about one minute. Provision is made so that the shaft can be uncoupled and the gate dropped by its own weight, the speed of descent being controlled by a friction brake. Two 30-hp direct-current motors, one at each end, drive the main shaft, and a third motor will be installed when the other water-wheels are added. A hand drive has been provided for emergency use in case the motor drive should fail.

Ordinarily a gate is lifted by starting the motor and throwing a clutch in by hand at each gate. It is also possible to bring the main shaft in such position that the clutch can be thrown in while the shaft is not running, the motor being started with one or two gates connected to the main shaft. The closing of the gate can best be effected by releasing the brake on the hand lever and lowering the gate as far as it will go by its own weight, then throwing in the clutch on the main shaft and driving the gate to a firm seat on the sill. In addition the clutch may be thrown in first, in which case the additional friction on the gate has to be overcome by the motor as long as there is any negative movement, after which the brake will be released. An adjustable brake on a combined brake pulley carries a special friction lining of rubber, and is fixed to a cast-steel lever keyed on a small shaft, on one end of which is a hand lever and on the other a lever for a solenoid dropping device and an adjustable spring for keeping the brake tight. The solenoid for the dropping device can be operated from the benchboard by pulling a switch, and the dropping speed can be so arranged that the gates reach the bottom without any damaging jar to the gate or hoist. This dropping device is used for emergency only.

POWER HOUSE.

The power house, gatehouse and transformer house are finished for six units, including rheostat and switchboard galleries, compartments for transformers and other apparatus. All of the headworks, foundations, etc., are completed for a 135,000-hp development, the only work required to prepare the power house for the full installation being an addition to the present superstructure. At the present time there are six units installed and in operation. The power house is 48 ft. wide and will be 500 ft. long inside, with a floor 14 ft. below the crest of the dam. The pen-

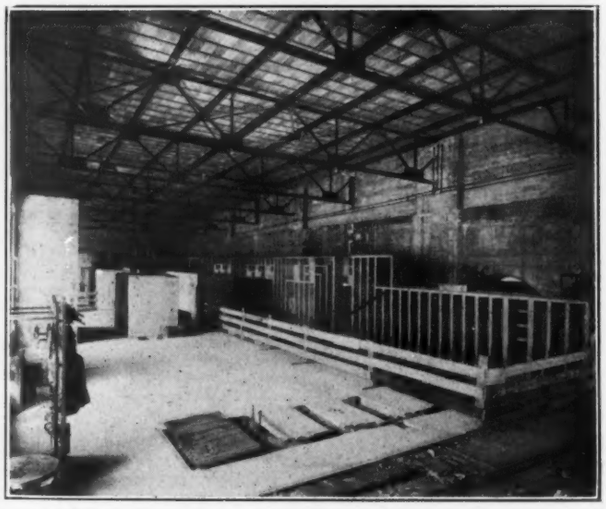


Fig. 3—Bus Compartments and Oil Switches.

stocks, wheel chambers and draft tubes are formed entirely of concrete. The wheel chambers are 22 ft. wide and 33 ft. high, and from them two draft tubes, one above the other, are carried to the tailrace.

The waterwheels are of the vertical shaft, inward and downward flow Francis type, built by the I. P. Morris Company, of Philadelphia. Each of the main units is

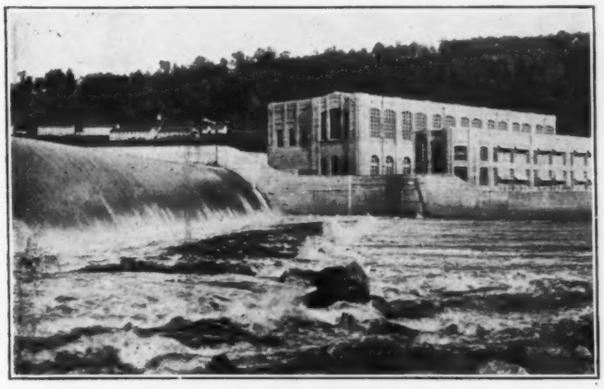


Fig. 4—Generating Station and Dam.

capable of developing 13,500 hp when operated under a head of 53 ft. and with 80 per cent gate opening. When running at its rated load and at 94 r.p.m., each turbine takes about 2700 cu. ft. of water per second. At times of ordinary flood the minimum head available will be 50 ft., and at times of low water the available head will be between 60 ft. and 65 ft. Two wheels are mounted on a single shaft of forged steel, and the entire weight is carried on a roller bearing supported by a casting set into the masonry. The draft tubes of the upper and lower wheels come out together below the level of the standing tail-water, so that it is possible to get at the upper wheel by closing the headgates. When the lower wheel requires attention stop logs may be used to cut off the tail-water, and the draft tube may be drained by electric pumps. The design of the wheels is such that with the available head reduced to the possible minimum during extreme floods, the turbines are capable

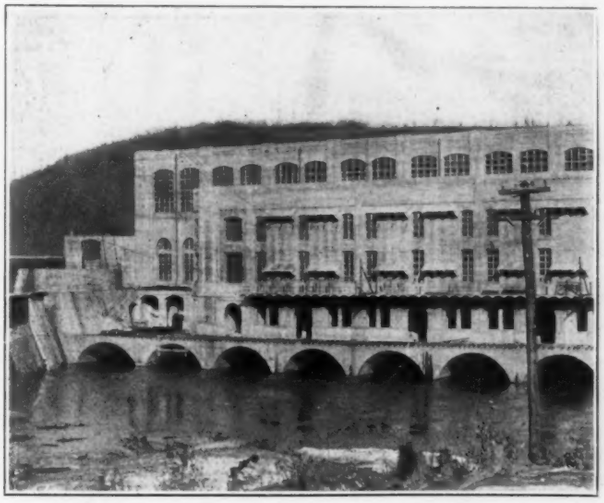


Fig. 5—Transformer House and Tailrace.

of giving their rated output with 100 per cent gate opening.

ELECTRICAL EQUIPMENT.

Five of the generators installed are of General Electric manufacture, and one was built by the Westinghouse Electric & Manufacturing Company. All of the machines are of the vertical waterwheel, internal-revolving-field type, delivering three-phase alternating current at 11,000 volts and 25 cycles. The machines are Y-connected, with a lead for grounding the neutral. Three of the General Electric machines are rated at 7500 kw, and the other two are rated at 10,000 kw. The Westinghouse machine is rated at 12,000 kw. In all of the machines the generator voltage is controlled by motor-operated field rheostats and the excitation is automatically controlled by Tirrill regulators. Pneumatic brakes are provided for stopping the machines, the brakes bearing on the revolving field ring.

Excitation energy is supplied by three machines, two vertical waterwheel-driven units rated at 400 kw, 250 volts and 240 r.p.m. These are compound-wound machines of General Electric manufacture and are fitted with interpoles. The third exciter is a Westinghouse horizontal motor-generator set, consisting of a 500-kw, 250-volt compound-wound, interpole, direct-current generator, mounted on a common frame with and direct-connected to a 750-hp, 10,500-volt, three-phase, 25-cycle, 750 r.p.m. synchronous motor.

TRANSFORMERS

There are six General Electric 25-cycle, three-phase, 11,000-70,000-volt transformers installed. The transformers are delta-connected on the low-tension side and star-connected on the high-tension side, with a grounding neutral lead. Four are rated at 7500 kw and two are rated at 10,000 kw.

The transformer house is located south of the power house and is carried by arches spanning the draft tube outlets in the tailrace. Provision is made for bringing the transformers into the generator room and under the main crane in case repairs are necessary. The general layout does not differ much from standard practice, and the scheme of connections from the generators through the transformers to the transmission lines and to the terminal station in Baltimore is shown in Fig. 7.

The barriers for the high-tension apparatus in the transformer house are built entirely of reinforced concrete. The compartments are located on both sides of a 12-in. division wall about 110 ft. long and the shelves and barriers are 4 in. thick.

TRANSMISSION LINE.

The transmission line is 40 miles long and is built in the

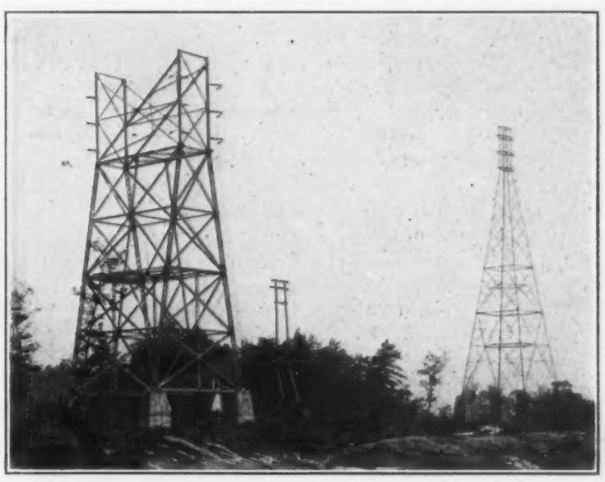


Fig. 6—Dead-Ending Tower and River-Crossing Tower.

most substantial manner. The line is strung over 415 four-legged galvanized steel towers made by Messrs. Milliken Bros., Milliken, Staten Island, N. Y. Two types of towers are employed, heavy-section and light-section towers. Heavy-section towers are used where the span is over 700 ft. and where there is an angle in the line. In straight, flat country one heavy-section tower is placed every mile. The six main cables, three for each line, are placed in two

vertical planes, spaced 15 ft., and the distance between wires in the same plane is 7 ft. On the top of the tower provision is made for stringing two ground cables, but at present only one, which is clamped to the center of the tower, is installed.

The standard height of towers is 44 ft. to the lower cross-arm, and the total height from the ground to the ground cable is 62.5 ft. It was found desirable, due to the rolling character of the country through which the line passes, to make use of 10-ft. and 20-ft. extensions in some places, so as to maintain as nearly as possible a standard span.

All of the light section towers have one of the four legs bolted to a steel tripod set 6 ft. in the ground, and only where unusual conditions in the ground made it necessary was concrete used. All heavy towers have each of their four legs bolted to angle irons set in concrete.

The six conductors consist of 300,000 circ. mil 19-strand aluminum cables, and the ground wire consists of a 3/8-in. double galvanized steel cable composed of seven strands. The insulators are of the suspension type, made by the Ohio Brass Company. On each light section tower five-unit insulators are used for supporting each cable, while on the heavy-section towers six units are used for dead-ending each cable.

Special towers are employed at certain places along the line, notably on the island near the station, where a 120-ft. tower is used, and also near Baltimore, where the lines cross the railroad right-of-way.

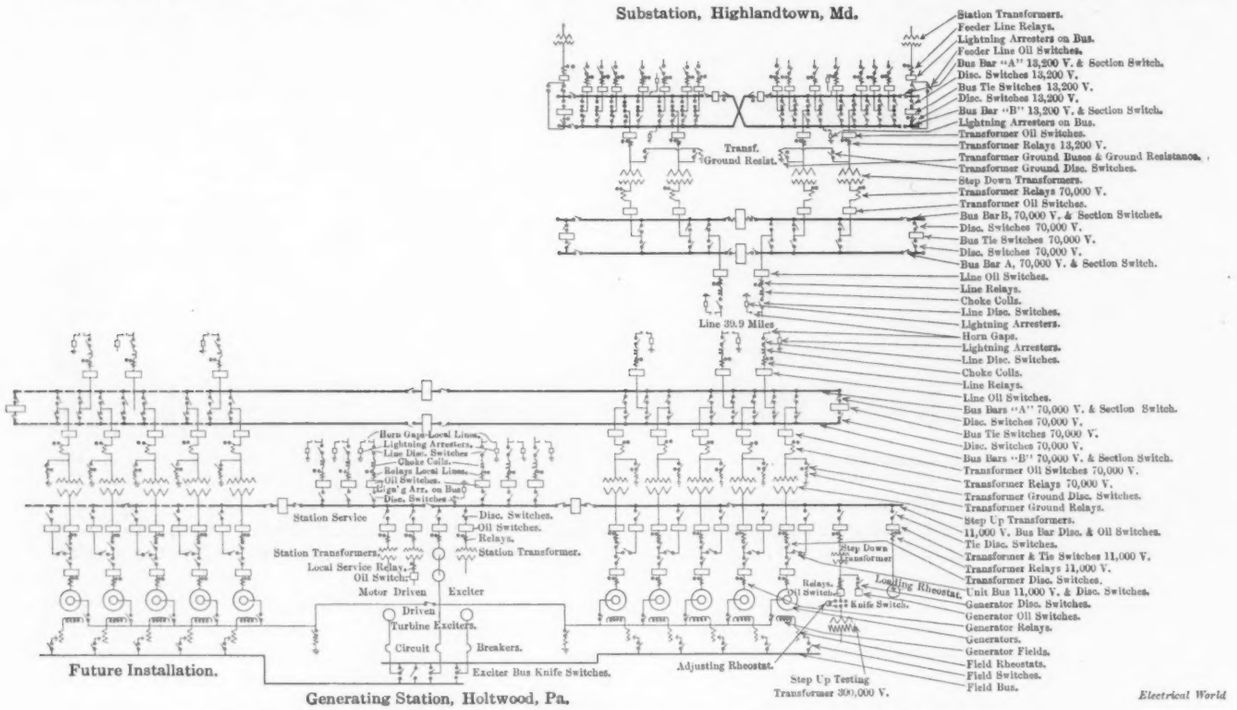



Fig. 7—Wiring Diagram for Generating Station, Transmission Line and Substation.

BALTIMORE TERMINAL STATION.

The Baltimore terminal station is located in the suburbs at Highlandtown, Md., and is built of brick, with footings, base wall, top coping, window sills and lintels, high-tension windows, floors, high and low-tension bus compartments as well as all barriers and transformer compartments, made of concrete.

The building is now 194 ft. 10 in. long, 54 ft. wide (inside) and 51 ft. high. Provision has been made for a 44-ft. extension on the north end, which will give the building its final quota of eight 10,000-kva transformers.

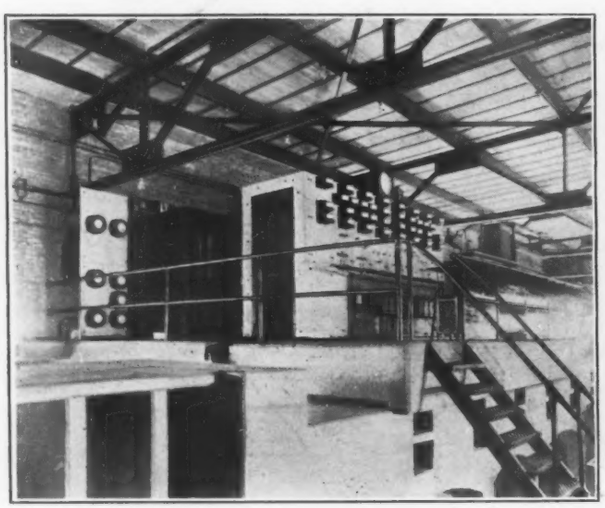


Fig. 8—Benchboard at Baltimore Terminal Station.

Fig. 9—Oil Switches at Terminal Station.

The ground floor of the building is taken up by the high-tension bus compartments, mains and station service transformers and a chamber with pumps for handling transformer cooling water, oil-treating outfit, also oil-handling pump and vacuum and compressed-air pumps. Along the entire length of the west side of the building is a standard-gage railway track, also a wider track with trucks for handling the transformers. All the piping is placed between and below the standard-gage track in a suitable pipe trench covered with reinforced concrete slabs. The first floor contains the transmission-line entrances, high-tension oil switches, low-tension oil switches and bus compartments, outgoing feeder compartments, charging set and storage battery with battery panels. The benchboard and meter panels are on an elevated platform underneath which is an electrically driven crane for handling the transformers.

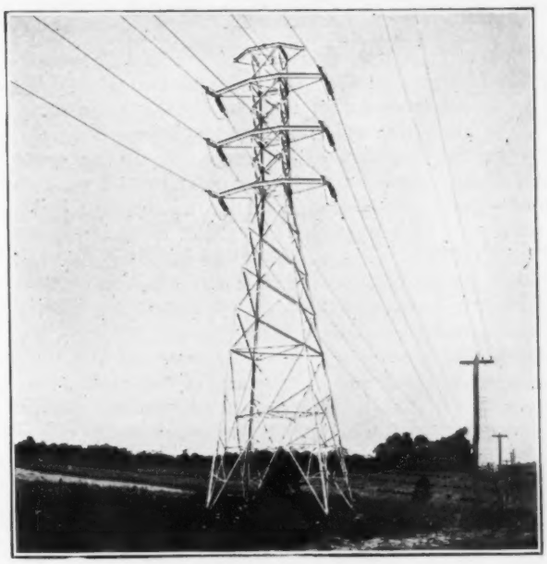


Fig. 10—Standard Strain Tower.

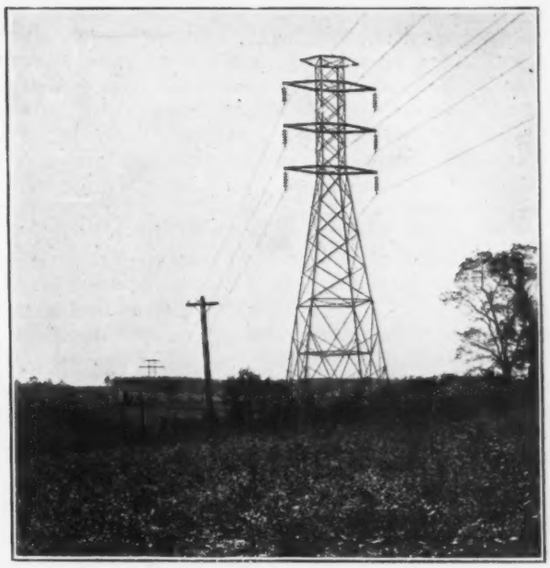


Fig. 11—Standard Transmission Tower.

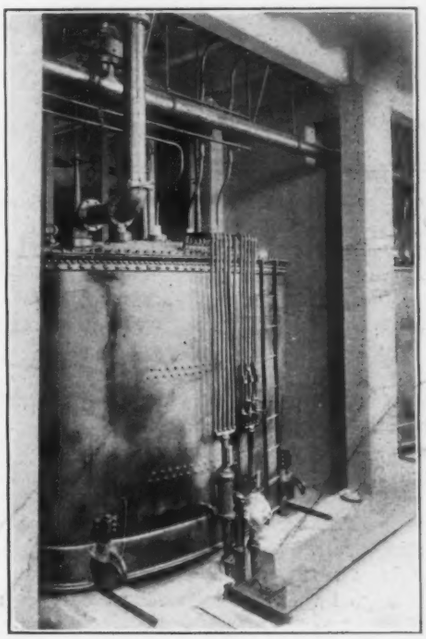
GENERAL DATA ON TRANSMISSION LINE.

| | |
|---|---|
| Altitude, ft., tower No. 177 | 690 |
| Altitude, ft., tower No. 394 | 35 |
| Average percentage of length of line wooded | 20 |
| Strain in ground cable when pulled up (25° C.), lb | 900 |
| Strain in main cable when pulled up (25° C.), lb | 525 |
| Concrete in foundation for Susquehanna River crossing towers, cu. yds. | 173 |
| Concrete in foundation for B. & O. R. R. crossing towers, cu. yds. | 200 |
| Concrete in foundation for all other towers together, cu. yds. | 650 |
| Total weight of tower material, tons | 2,066 |
| Total weight of insulators, tons | 165 |
| Total weight of aluminum cables, lb | 175,000 |
| Total weight of ground cables, tons | 63 |
| Average span, ft | 500 |
| Number of light-section towers | 311 |
| Number of heavy-section towers | 104 |
| Length of larger spans: | |
| Over Susquehanna River, Pa., ft | 1,750 |
| Over Muddy Creek, Pa., ft | 1,000 |
| Over Big Gunpowder River, Md., ft | 1,280 |

ELECTRICAL EQUIPMENT AND CONTROL.

The two three-phase circuits of the transmission line enter the substation on the west side, the lightning arrester horn-gaps being installed on steel towers outside, while the electrolytic cells are placed inside. Each circuit goes through disconnecting switches, choke coils and series transformers to a 70,000-volt automatic motor-operated oil switch, then through disconnecting switches to the two sets of high-tension busbars. These buses have oil section switches in the middle, with disconnecting switches on each side and oil tie switches at each end of station with bus knife switches for cutting out the oil switch. The buses are made of copper tubing, 1 in. by ⅞ in., supported by post insulators, and are in a concrete bus structure.

From the two sets of high-tension buses, connection is made through disconnecting and oil switches to the high-tension side of the 10,000-kva transformers; from the low-tension side the leads are taken through oil and disconnecting switches to the two sets of low-tension (13,200-volt) buses. The low-tension buses, which are made up of two bars of 3-in. by ¼-in. hard-drawn copper, have section switches in the middle and tie switches at each end, like the high-tension buses. All connections from the buses to the switches are made with copper tubing. From the buses leads are taken through disconnecting and oil switches to the three-phase outgoing feeder compartments. These compartments are occupied by the various series and shunt transformers for the meters and relays and also disconnecting switches. From the feeder compartments the leads, made up in one 13,200-volt lead-covered cable, are taken through clay ducts to a cable vault and thence to the



Fif. 12—Transformer at Baltimore Substation.

underground distribution. A storage battery provides control and operating energy for the various oil switches.

The benchboard is made of blue Vermont marble and has eight panels—both front and back. The front panels have an upper section on which are located the various meters; on the desk section are the control-switch indicating lamps and mimic buses; the lower section has the time-limit relay for operating the various oil switches. The rear panels are located 4 ft. back of the front ones and all supported from a pipe framework. Back panels are made up in three sections and have mounted on them the curve-drawing wattmeters, voltmeters, station service switches, etc. Separate panels are provided for mounting the outgoing feeder meters.

TRANSFORMER COOLING SYSTEM.

Cooling water for the 10,000-kva transformers is pumped from a well on the premises to a cistern and from there to a tower tank 75 ft. high, from which it flows to the transformer inlets. The warm water from the transformer is pumped to the roof, where it is cooled by spraying, after which sufficient of it is allowed to run into the cistern and mix with the cold water from the well to keep the cooling system in operation.

The transformers are connected through 8-in. piping

Fig. 13—Line Entrance at Baltimore Terminal Station.

and back-pressure valves to an 8-in. relief header, which allows the gases or foaming oil to escape in case of injury to the transformers. The back-pressure valves prevent impure oil from getting into uninjured transformers.

TRANSFORMERS.

The five transformers at present installed are of the Westinghouse oil-insulated, water-cooled type, rated at 10,000 kva on balanced load and designed to step down the potential from 60,000 volts to 13,200 volts. They are 25-cycle, three-phase machines delta-connected on the high-tension side and star-connected on the low-tension side with grounding neutral lead.

There are two small transformers of General Electric make rated at 50 kw each, which reduce the potential of the three-phase, 25-cycle main secondary circuit to 220 volts for station service. In addition there is a 10-kw motor-generator set made up of a 15-hp induction motor and a 10-kw, 250-volt generator, the output of which is employed to charge a 124-cell Gould battery.

The output of the system is at present used by the lighting and railway companies of Baltimore, and work on extensions to the system is now in progress. Mr. J. E. Aldred is president of the Pennsylvania Water & Power Company and Mr. F. A. Allner is general superintendent. The company maintains offices in New York and Baltimore.

## THE USE OF NAKED ALUMINUM WIRE IN ELECTROMAGNETS.

### Advantages of Reduced Cost, Reduced Weight and Higher Permissible Temperature as Compared with Insulated Copper Wire.

By H. F. Stratton.

THE Bureau of the Census of the United States government estimates that insulated copper wire and cable to the value of about $52,000,000 is sold annually in this country. If a material can be proposed which, from an engineering standpoint, would be a satisfactory substitute for even a portion of the insulated copper wire used, and which would exhibit conspicuous monetary economies in a large number of instances, it must be seen that the subject is of such commercial importance as to warrant a careful analysis of the underlying facts. If, in addition, the substitute material betrays advantages over insulated copper wire used in electromagnets, and if these advantages embrace such important characteristics as reduced weight and higher permissible temperature rises, then the subject becomes increasingly important to the electrical industry.

It would seem logical, first, to weigh the relative advantages and disadvantages of the uses of naked aluminum wire and insulated copper wire for magnet windings, from a design standpoint, and then to determine if the use of aluminum wire for the purpose under discussion will successfully stand the application of the general equation of financial feasibility.

On the basis of the Matthiessen standard, the conductivity of 99 per cent aluminum is 61 per cent of that of annealed copper, which possesses the characteristics of copper used in magnet wire. A bare aluminum conductor will therefore be 64 per cent larger in cross-sectional area than a bare copper conductor of equal conductivity.

If aluminum wire is to replace copper wire in the same coil space, it is clear that there must be some inherent difference between the two conductors to compensate for the lower conductivity of aluminum. Only a partial answer to this need is found in the fact that oxide of aluminum is readily formed on the surface of naked aluminum wire, and this oxide is a successful insulator for an emf of 0.5 volt or less, is highly refractory, not being altered by temperatures greatly in excess of those permitted in most electrical machinery, and is relatively inert in the presence of moisture and organic and inorganic acids and alkalis. The insulating material which is wrapped on copper wire, on the other hand, occupies a considerable volume compared to the volume of the copper conductor, particularly in the smaller sizes of wire, and, furthermore, has some distinct disadvantages from the standpoint of attack by high temperatures and chemical agents, which will be discussed at more length below.

Fig. 1 gives a graphic comparison between round copper wire and both round and square aluminum wire of sizes having conductivity equal to the conductivity of the various sizes of copper wire. In general, and approximately, the conductivity of any one size of copper wire is equivalent to the conductivity of round aluminum wire of the next two sizes larger, and to the conductivity of square aluminum wire of the next one size larger, in terms of the B. & S. wire gage.

Since the aluminum oxide should not be exposed to a potential stress larger than 0.5 volt, this oxide film is, in general, serviceable only between turns and not between layers, and it is necessary to wind on a sheet of some insulating material, such as asbestos paper, between layers. The writer has found, in his experience with aluminum coils, extending from a coil containing perhaps ¼ lb. of aluminum up to a coil containing about 400 lb. of aluminum,

that the thickness of the insulating material between layers can be successfully taken as about 10 per cent of the diameter of the wire.

Taking this additional space into consideration, Fig. 2 indicates for various sizes of wire the percentage of the number of aluminum conductors per square inch of cross-section of coil to the number of copper conductors per square

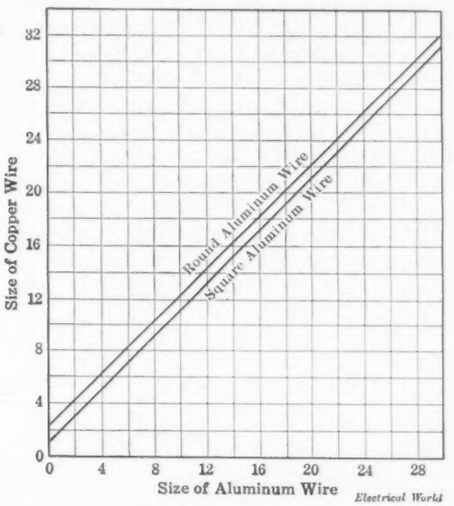



Fig. 1—Relation of Aluminum and Copper Wires of Same Conductivity.

inch of cross-section of coil, the aluminum wire being considered bare and having an insulating sheet between layers, and the copper wire being considered to have a single cotton-covered insulation. On this basis, aluminum wire is at a disadvantage in sizes larger than No. 5, but in smaller sizes the aluminum wire enjoys an increasing advantage, rising to a "space utilization" of 180 per cent in the case of No. 30 aluminum wire. In Fig. 2 no attention has been paid to the fact that the conductivity of aluminum is less than that of copper, and if this consideration be properly injected into the problem it is seen that this condition exists: First, comparing single-cotton-covered copper wire with round aluminum wire, the space utilization for the aluminum wire, on a basis of equal conductivity, is unity at No. 29 size of copper wire, is less than unity in larger

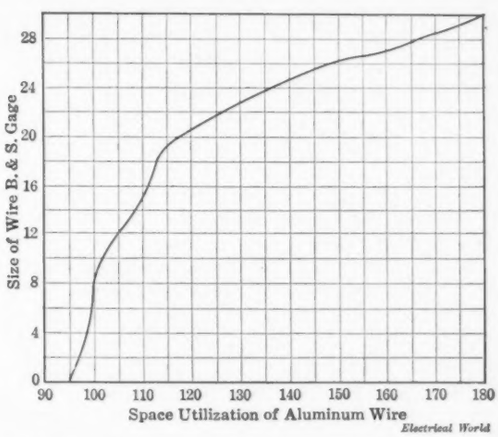



Fig. 2—Space Relations of Copper and Aluminum Wires.

sizes and is greater than unity in smaller sizes; and second, comparing the single-cotton-covered copper wire with square aluminum wire, the space utilization of the aluminum wire, on the basis of equal conductivity, is unity at No. 25 size, is less than unity in larger sizes and is greater than unity in smaller sizes.

On the basis of equal conductivity and equal length of conductor it is evident from the statements just made that in most sizes bare aluminum wire will occupy more space than single-cotton-covered copper wire, and where the problem is one of replacing a copper coil by an aluminum coil in a fixed coil space in standard apparatus there is evidently small opportunity of accomplishing the desired

| Size of Copper Wire, B. & S. Gage. | Percentage Saved, Round Aluminum Wire. | Percentage Saved, Square Aluminum Wire. |
|---|---|---|
| 0 | 32 | 20 |
| 5 | 33 | 20 |
| 10 | 36 | 25 |
| 15 | 40 | 20 |
| 20 | 27 | 2 |
| 25 | 36 | 17 |
| 30 | 26 | −8 |

result if the characteristics of the copper coil must be duplicated by those of the aluminum coil. In many cases it would be pertinent to inquire, however, if a higher ultimate temperature should not be permitted in aluminum coils than in coils constituted of single-cotton-covered copper wire. There are undoubtedly many examples of com-

Fig. 3—Aluminum Coil Containing About 400 lb. of Wire, Operated at 300 Deg. C.

mercial apparatus where the permissible coil temperature is dictated solely by the consideration that this temperature should be kept safely below the charring temperature of the cotton insulation. It has generally been assumed that coils wound with single-cotton-covered wire should not reach a higher ultimate temperature than 100 deg. C., and in many cases specifications for lower temperatures are proper and are warranted by considerations of precautions or reductions of the $I^2R$ losses.

On the other hand, the writer is familiar with the history of a large aluminum coil which, in a lifting magnet, has been subjected almost constantly day and night to a temperature of about 300 deg. C., and which, after quite a long period of operation, as yet shows absolutely no measurable change in resistance. It goes without saying that a coil composed of cotton-covered wire and subjected to these same operating conditions would by this time have failed completely. It should be noted that the aluminum coil in question, in addition to being subjected to extremely high temperature, also withstood mechanical abuse the severity of which is probably second to none experienced in electrical apparatus.

Where the increase in resistance due to rise in temperature has determined the final temperature of copper coils, a slightly higher temperature may be permitted with the same results in the case of aluminum coils, since the tem-

perature-resistance coefficient of aluminum is about 6 per cent less than that of soft copper.

It has been contended by some German advocates of the use of aluminum wire that aluminum coils may be safely depended upon to absorb considerably more heat than similar copper coils, their arguments being based on the fact that the specific heat of aluminum is about 148 per cent greater than that of copper. However, if all the facts surrounding this situation be taken into consideration, it does not appear that this is a conspicuous advantage, if, indeed, it is any advantage at all. When it is recalled that the weight of an aluminum coil is about 49 per cent of that of a copper coil of equal conductivity and equal length of conductor, it will be found that only 16 per cent more watt-seconds are required to raise the temperature of the aluminum coil to a certain point than would be required to raise the temperature of an equal copper coil by the same amount. This conclusion, however, is based on what might be called "heat inertia," representing the ability of the coil to absorb —by a rise in temperature—a certain amount of energy, but not in any sense indicating the continuous temperature of the coil. This latter feature is purely a balance between the heat generated in the coil and the ability of the coil to get rid of this heat and is determined by its thermal conductivity, radiating characteristics and its ability to transmit heat to other portions of the machine, which in turn serve to convey the generated heat to the surrounding atmosphere.

The writer does not conclude, therefore, that the designer is justified in allowing more watts to be transformed into heat in an aluminum coil than he would in a copper coil, unless he is influenced by one of the following considerations—first, the lower temperature-resistance coefficient of aluminum, permitting a higher temperature rise for the same increase in resistance than in the case of copper, or, second, the very much higher temperatures which are safe in the case of aluminum coils because of the permanence of the insulation at high temperatures.

When, however, the question of coil weight is considered, the advantage of aluminum over copper is so conspicuous as not to be open to argument. This can be summarized by merely stating that an aluminum coil will weigh about 49 per cent as much as a copper coil composed of single-cotton-covered copper wire and of equal conductivity and length of conductor.

When the very important question of cost is considered, the use of aluminum seems to show some startling advantages. The accompanying table was prepared showing the saving in the cost of conductor secured by using bare aluminum wire in place of single-cotton-covered copper wire, and assuming in each case that a size of aluminum wire was employed having a conductivity equal to that of copper wire. This table considers round and square aluminum wire of several typical sizes, from No. 0 to No. 30 inclusive, which are at present the only sizes of aluminum wire on the market. It was based on quotations existing in May, 1912, and is, of course, inconsistent in its relative figures pertaining to different sizes of wire, since it takes into account the arbitrary fixing of prices of both aluminum and copper. It should not, by any means, be assumed that the total cost of aluminum coils should be less than the total costs of copper coils in the ratio indicated by this table, since the winding and other processes of manufacture of aluminum coils will be found to be more expensive than similar operations in the case of copper coils. This table does, however, indicate the possibilities of large monetary savings to the electrical industry, when it is remembered that insulated copper wire to the value of many millions of dollars is used annually in building the various kinds of electrical machinery. It would seem that these figures are an admonition to the electrical engineers to direct their energies to the determination of successful and economical methods of winding aluminum wire, and to the producers of aluminum wire to foster an industry of large potential magnitude by fixing their prices consistently and at figures which contemplate only a reasonable profit.

While there is considerable literature relating to the cost and engineering features involved in the use of aluminum conductors for overhead transmission and some published information of a rather theoretical nature concerning the use of aluminum wire in electromagnets, yet there seem to be few, if any, obtainable instructions which would inform a manufacturer just how to build an electromagnet wound with bare aluminum conductor. The determination of the length and size of conductor is not a difficult matter and merely means the use of the data relating to conductivities, temperature-resistance coefficients, etc., all of these data being readily available in a number of electrical handbooks and also to quite a large extent in the catalogs on aluminum. It should be noted at this point, as an interesting fact, that if a reasonable quantity of aluminum wire of any one size be ordered at a time, this wire can be obtained either square or round, of any desired cross-sectional area within certain limits. In other words, it is not necessary to select aluminum wire according to the various wire gage numbers.

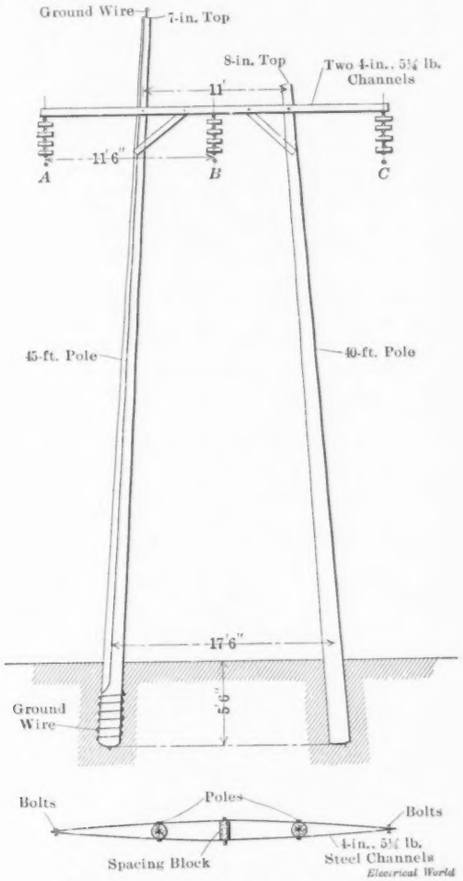
Aluminum wire can be purchased under the supposition that is is enveloped in a skin of aluminum oxide. The writer, however, has not been able to wind coils of such wire which do not exhibit a serious degree of short-circuit, either because the oxide did not sufficiently inclose the wire when it was received from the wire manufacturers or because the oxide was partly scraped off during the process of winding. In Europe some manufacturers claim to have formed the oxide successfully on the surface of the wire after the coil has been wound, by thoroughly wetting the entire coil structure with water and then heating the coil. In such a case the oxide is supposed to be formed by the presence of the hot moisture. The writer, in attempting to carry out this process, succeeded in forming a considerable degree of the oxide, but not enough to prevent a partial short-circuit, and not nearly enough to produce a coil of absolutely stable and uniform resistance. Very successful results have been obtained by passing the wire through a solution of sodium hydroxide as the wire is wound on the coil and then drying out the solution by passing current through the coil winding. The current, of course, should be regulated by a rheostat, as initially quite a degree of short-circuit will exist, but as the temperature of the coil increases with the progress of the chemical action and as the moisture is driven off, the resistance of the coil will increase until it reaches a point where no short-circuit exists in the entire coil structure.

It is difficult to say definitely just what is formed by the action of sodium hydroxide, but it is certain that, as a partial or a preliminary condition, a sodium aluminate is formed. In the presence of heat this sodium aluminate may be partially or completely broken up into several constituents, of which aluminum oxide would be one. Irrespective of the precise chemical composition of the substance which results from the action of sodium hydroxide and metallic aluminum, the fact remains that this substance, in practice, has proved to be stable and a sufficiently good insulator.

In winding large coils which contain such length of conductor that joints must be made it will be found that the aluminum wire can be easily and successfully welded together. The procedure is first to cut off the two ends of the wire squarely and hold each of them in the flame of a blow-torch until they become molten. The film of aluminum oxide which will surround the coil, being very highly refractory, does not melt and serves to inclose and retain the molten metal. After the two ends have reached this condition they should be suddenly pushed together, and it will be found that a weld will be secured which will exhibit nearly, if not entirely, 100 per cent strength and electrical conductivity.

## WOODEN TOWER WITH STEEL BOWSPRING CROSS-ARM FOR 100,000-VOLT TRANSMISSION LINE.

THE wooden transmission-tower construction shown in the sketch below has been adopted by the Central Colorado Power Company for a new 70-mile line at 100,000 volts. Each tower comprises one 45-ft. and one 40-ft. pole, which are set into the ground to a depth of 5 ft. 6 in. At the ground line the poles are separated by a distance of 17 ft. 6 in., and converge to a distance of 11 ft. at a level 35 ft. above the ground. The cross-arm is formed of a pair of 4-in. 5¼-lb. steel channels bolted together at




Wooden Tower for 100,000-Volt Line.

their ends and inclosing the poles as a bow-spring. Although pinned to the poles by through-bolts the spring pressure of these deflected channels is sufficient to grip the cross-arm securely in position. A 10-in. spacing block is inserted at the mid-point of the bow, and the channels are braced to the poles with 4-ft. knee-pieces. These towers are being spaced at 500-ft. intervals throughout the 70-mile line which is under construction.

The arrangement of suspension insulators used places all three phase-wires in the same plane. While such disposition is susceptible of slight theoretical disadvantages, the arrangement has the great practical advantage of permitting any wire to be reached and worked upon without danger of contact with the others. As the sketch shows, the ground wire is carried at a distance of nearly 8 ft. from the nearest conductor. At each pole a ground tap is run down under staples and wrapped in a spiral about the pole butt to provide a permanent earth connection. The Central Colorado Company has used a construction similar to this in some of its 13,000-volt lines, where the bow-spring cross-arms are formed of two 6-in. by 6-in. hardwood members. With this construction spans as long as 1100 ft. have been used.

Another special modification used on these 13,000-volt lines where it is desirable to avoid guying against the terrific winds that prevail in the region has been an A-frame arrangement. Two 30-ft. poles are erected 30 ft. apart, at an angle of 30 deg. with the perpendicular, forming an equilateral triangle. The frame is linked and braced by ⅝-in. bolts extending through plate cross-pieces. At distances 6 ft. down each pole, measured from the apex of the frame, provision is made for attaching strain insulators, the jumpers between spans passing around the poles. The top wire is then attached to the frame cross-piece, while the lower conductors clear the ground by 20 ft. This construction has been used in a mountainous country for a distance of nearly 3 miles, the maximum of the forty-seven spans being 1100 ft.

## THE POLARIZATION EMF OF A MIXTURE OF CLAY, FELDSPAR AND QUARTZ.

By A. A. Somerville.

IN this day of electrical heating apparatus used for scientific, technical and domestic purposes, insulation is an important factor. Electrical insulation is necessary; thermal is desirable. The former has been almost perfectly attained; the latter is an indefinite quantity. Insulating power or resistance varies with the temperature; hence it is desirable to know the function of variation when designing heating apparatus. Having studied the temperature coefficients of electrical resistance at high temperatures of many of the metals and alloys now obtainable, it was thought desirable to extend this work to the clays, oxides and rare earths, one reason for starting on this line being that since a metal ordinarily oxidizes at high temperatures it seemed well to start with the oxide and see what it would do when heated under simple conditions.

This work is to be continued probably for some years, and the one great difficulty now is that of securing a binding material to hold the other materials in the form of a solid conductor or insulator. They must be in the form of a solid, for if they are pasty, electrolysis occurs, forming a film of hydrogen which makes a high resistance, and if they are in the form of a powder, the resistance depends not only on the temperature, but to a much greater degree upon the pressure, which in itself may vary with temperature. These factors may combine to make a conductor which will carry electrical current at comparatively low temperatures and act as an insulator at higher temperatures. There being a sharp break in the temperature-resistance curve at a certain temperature, this bend in the curve can be located at any point on the temperature axis by varying the percentage of the ingredients in the resistor. The powdered unit offers the greatest field for research and invention, since it can readily be arranged to have a low resistance, and the objection to the solid-unit metals excepted is that they have too great a resistance to be self-heating at ordinary voltage. It may be possible to proportion properly certain ingredients and bake them so as to form a solid which will be self-starting and controlling, but as yet everything of this nature has the characteristics of the Nernst glower, in that it must be heated before it will carry sufficient current to sustain its temperature automatically and a balancing resistor such as iron must be used to prevent an overload coming on and melting the conducting filament.

However, the solids of clay and rare earths exhibit some other peculiar properties that are interesting. For instance, it has been found that the Nernst filament and platinum give the largest thermal emf of all materials known. A mixture, of which the subject of this article gives some idea, acts as a sort of storage battery or condenser, in that it will give off current some hours after it has been charged and has a definite emf which is readily measured

and is dependent on temperature, time of charging, charging voltage and electrodes used, and the rate of discharge is also dependent upon these same factors, but in a different way.

The specimens were made by Mr. Charles F. Binns,

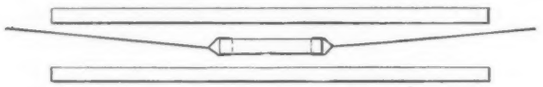


Fig. 1—Pottery Suspended by Wires in Tubular Furnace.

director of the New York State School of Clay-Working and Ceramics, located at Alfred, N. Y.

Designs for these specimens were furnished so that they would be of suitable shape and size for the measurement of the resistance thereof. They were in the form of short heavy rods about 1 cm in diameter and 5 cm in length, having holes near either end through which to pass wires in order to make mechanical connections. They were baked at a temperature of 1100 deg. C. and look like a cheap grade of white porcelain.

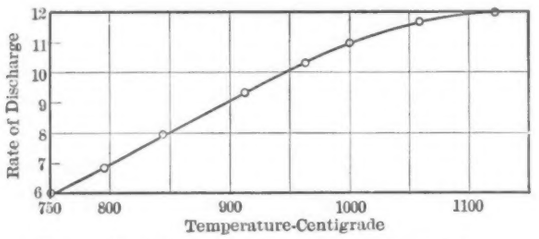



Fig. 2—Variation of Discharge with Temperature.

The percentage analysis of these pottery mixtures is shown in the accompanying table.

ANALYSIS OF POTTERY MIXTURES.

| Number. | Clay. | Feldspar. | Quartz. |
|---|---|---|---|
| 1 | 45 | 22 | 33 |
| 2 | 50 | 20 | 30 |
| 3 | 55 | 18 | 27 |
| 4 | 60 | 16 | 24 |
| 5 | 65 | 14 | 21 |
| 6 | 70 | 12 | 18 |
| 7 | 75 | 10 | 15 |

In each case the clay was composed of equal parts of English ball clay, brand M and M, and English china clay, brand MGR, both of which are very adhesive and hence make good binding agents. The ground feldspar and quartz required something like this clay to make them into solids

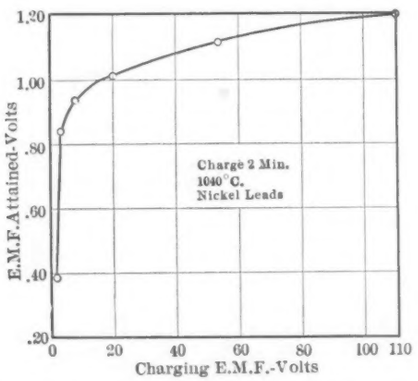



Fig. 3—Variation of Final Emf with Charging Emf.

having some mechanical strength. The varying of the percentage of these mixtures did not show any striking results, and the seven different classes may all be considered as one so far as present results show.

The electrical resistance behavior of the mixtures under temperature is much like that of glass, quartz or porcelain. That is, at room temperatures they are almost perfect insulators and as the temperature is increased there is a definite value where the resistance begins to decrease rapidly, this temperature being from 400 deg. to 700 deg. C., and then at about 1000 deg. the rate of change is relatively much slower.

The specimen was suspended in a horizontal, tubular,

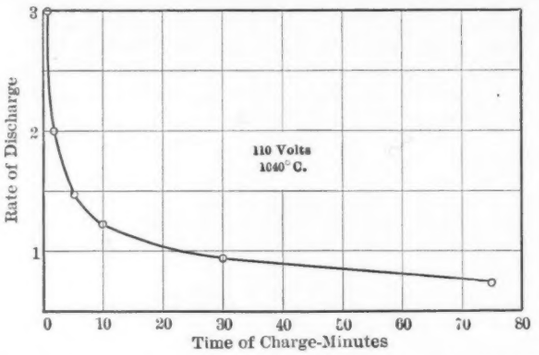



Fig. 4—Variation of Discharge Rate with Time of Charge.

spirally wound resistor furnace. Temperatures were measured by a resistance thermometer and indicated on an automatic recorder. The whole apparatus has been in use about five years and has been fully described in the *Electrical World* and *Physical Review*; it is of a simple type and need not be further described.

When the specimen was heated to about 1000 deg. C. and an attempt was made to measure its resistance it was found that there was the equivalent of an emf in that arm of the

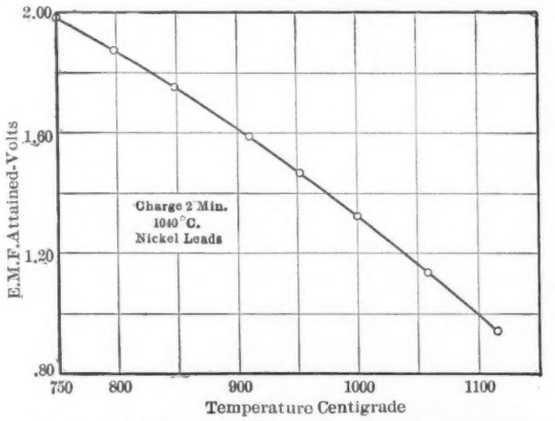



Fig. 5—Variation of Final Emf with Temperature.

Wheatstone bridge in which the specimen was placed. Only a single dry cell was being used on the bridge, but even this low voltage was sufficient to produce a polarization or counter emf in the mixture of clay, feldspar and quartz, so that alternating current had to be used to determine its resistance, while the direct current was employed in the study of this more interesting phenomenon of a counter emf produced in the pottery mixture acting as an electrolyte, dielectric or storage battery.

The counter emf was studied by means of a potentiometer, the specimen being placed in a direct-current circuit of known voltage, at a certain temperature and for a given length of time; then a switch was thrown to disconnect the specimen from the source of voltage and connect it into the potentiometer circuit. After some few trials a balance could be obtained in about ten seconds and the so-called polarization emf thereby determined.

Use was made of nickel lead wires because they do not oxidize readily. In a few cases lead wires of other metals, such as nichrome or iron, were used, and they seem to in-

dicate that the phenomenon is a function not only of the electrolyte but also of the electrodes as well. For instance, the discharge in the case of nichrome is about four times as fast as when nickel leads are used. The rate of discharge also depends upon the size of the electrodes or leads.

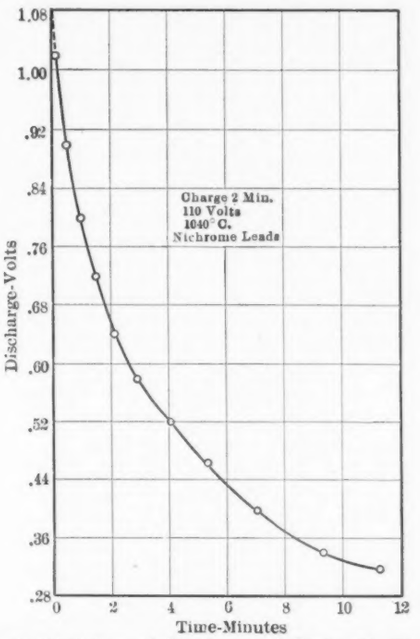



Fig. 6—Variation of Discharge of Emf with Time.

On the theory of the condenser the size of the leads would help to determine the capacity.

The voltage obtained is a function of the time of

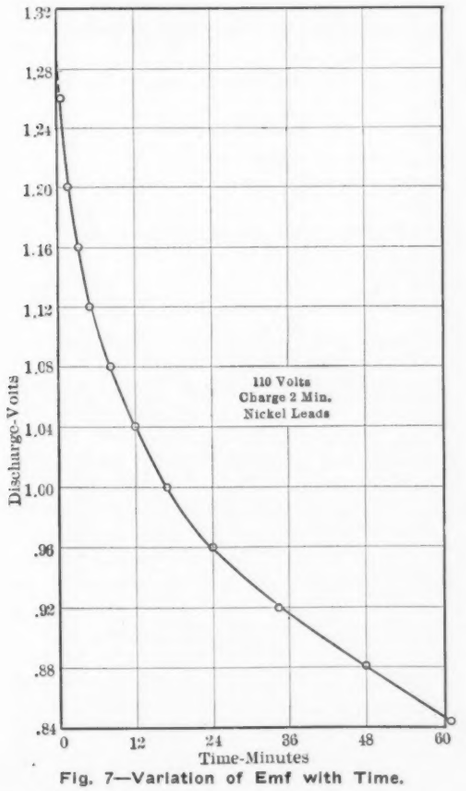



Fig. 7—Variation of Emf with Time.

charging; it is found that about 95 per cent of the maximum voltage is to be had at the end of two minutes after beginning to charge. After that time the rate of increase in voltage is slow.

The voltage obtained is also a function of the charging emf, and 4 volts impressed produces a counter emf that is 75 per cent as large as when 110 volts is used to polarize the specimen. The counter emf produced is also dependent upon the temperature, and decreases as the latter increases. The effect is twice as great at 750 deg. as at 1100 deg. C. The rate of discharge is dependent for one thing upon the

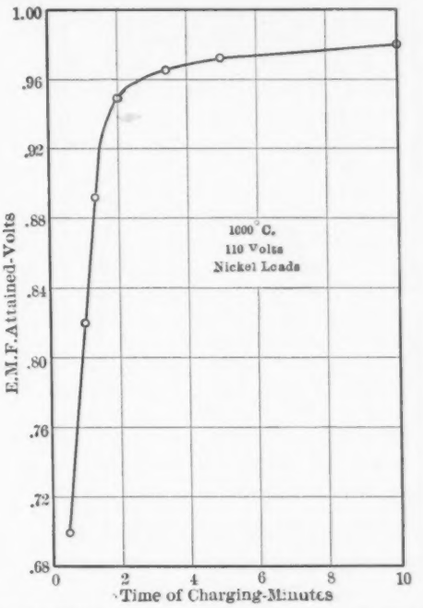



Fig. 8—Variation of Final Emf with Time of Charging.

time of charging. There is a rapid drop in voltage for ten minutes and then a slow uniform decrease. The rate of discharge might be expected to be dependent on the temperature, since the resistance varies greatly therewith. As a fact the discharge is twice as fast at 1100 deg. as at 750 deg. C., but this is not nearly so large a difference as would be expected, since the resistance varies by as much as a factor of at least 1000.

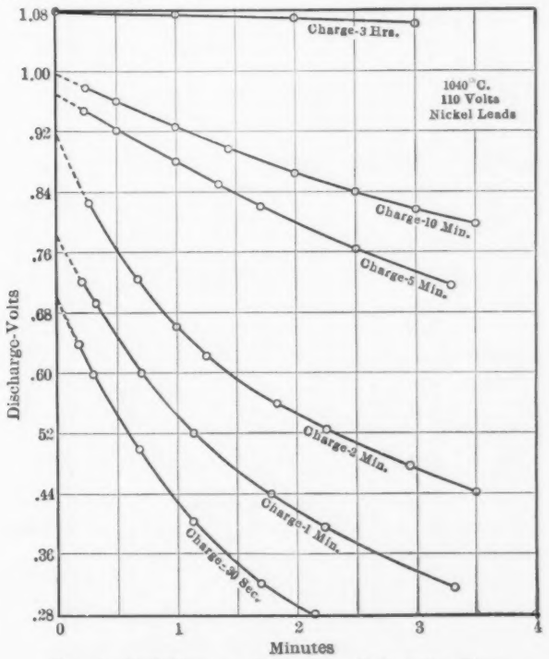



Fig. 9—Variation of Discharge Emf with Time.

It will be interesting to determine how various lead wires will affect the results and just what there is about these pieces of pottery that causes this phenomenon, which has as yet not been found in any other mixture of porcelain or pottery.

# Central Station
## Management, Policies and Commercial Methods

### NEWSBOYS' TOAST-EATING CONTEST.

A special sale of electric toasters on Aug. 10 by the Oklahoma Gas & Electric Company, Oklahoma City, was featured by Mr. Robert C. Leonard, manager of the new-business department of the company. The sale was advertised in all the papers, and an arrangement was effected with a dealer in electrical supplies by which a novel demonstration of electric toasters was made. It was announced in the papers that during certain hours of the day the newsboys of the city would participate in a toast-eating contest in the dealer's show-window. The terms of the contest were that each newsboy should receive 1 cent for every slice of toast he could eat during a period of fifteen minutes. In addition, the boy who stowed away the most toast was to receive a prize of $1. This unique contest excited a great deal of attention. The newsboys responded with alacrity, and while the contest was on the sidewalk in front of the window was blocked with spectators enjoying the laughable and unusual sight. The toast was made by electricity, of course. Thirty-seven toasters were sold during the day, while the influence of the contest was shown in increased demand for toasters on succeeding days. The contest, which was held in the store of Arnold & Wetherbee, was won by a newsboy who ate six pieces of dry toast in the time specified.

### ADJUSTMENT OF CUSTOMERS' COMPLAINTS.

If customers are worth having, they are worth satisfying. The right kind of answers to complaints, like good collection letters, are largely a matter of attitude, declared Mr. F. J. Maxwell, of Fond du Lac, Wis., before a recent meeting of the Wisconsin Electrical Association. Every day that a complaint hangs over it becomes increasingly hard to handle, and quick attention will preclude many possibilities of future unpleasantness. Assume a fair and open-minded

Form 207.

No. 1922 EASTERN WISCONSIN RY. & LIGHT CO.
FOND DU LAC, WISCONSIN.

Date 191

Name Street

NATURE OF COMPLAINT

TIME

| REPORTED | RECEIVED BY EMP. | CORRECTED |
|---|---|---|
| A. M. | A. M. | A. M. |
| P. M. | P. M. | P. M. |

THE ABOVE ORDER HAS BEEN ADJUSTED TO MY SATISFACTION

Consumer

Employe

Complaint Record Used at Fond du Lac, Wis.

position, for there is nothing to be gained by allowing one's self to become aroused over anything the man with a complaint may say or write. "Back talk" simply irritates the customer instead of pacifying him and leaves the grievance farther from settlement than it was before. Nor should the central-station man give the complainant the satisfaction of knowing that his temper has been stirred.

All complaints reported to the office of the Fond du Lac company are made out on duplicate slips numbered consecutively and stating the nature of the complaint, time reported, and by whom received. The original goes to the operating department, which remedies the trouble. After this has been adjusted the customer's signature is secured to the statement that the complaint has been adjusted to his satisfaction. The clerk retains the duplicate until the original is returned. In some cases a return postal card similarly worded is used.

Complaints on account of large bills are handled by the chief accountant. The complainant whose trade is worth retaining is certainly worth individual attention, and if the customer thinks there is an error in the company's statement of his account, an investigation must be made to see if the meter was read correctly, the number of days the bill covers, etc. Care should also be taken to assure the complainant that investigation will start immediately.

The object is to show courtesy, tact and open-minded fairness and to allow the complainant to do most of the talking, for his system is at high tension. He should not be angered and after he has "blown his fuse" and his voltage is normal he can be shown that his trouble is understood. By this plan, his spirit of fairness is aroused.

If desired, the customer's meter will be tested at Fond du Lac and a report mailed to him. A letter accompanies each of these reports saying that the company is pleased to hand therewith a report from the meter-testing department showing how the meter has tested on various loads and adding that it is the company's aim to give the public the best of service and that it will be pleased to hear in regard to any complaints so that it may have an opportunity to investigate these.

At Fond du Lac during the past thirteen months an average of 0.5 per cent of the total number of meters have been tested by request each month. Of these 328 meters tested, 161 proved 100 per cent accurate, 105 within 2 per cent correct, 30 over 2 per cent slow and 32 over 2 per cent fast.

It is appreciated that courtesy goes a long way toward establishing pleasant relations between the company and its patrons, and that "a smile will draw a dollar when a grunt will cause a chill."

### INDIVIDUAL METERS IN GARAGES.

For some time the Commonwealth Edison Company of Chicago has been urging the keepers of garages to make their charges to their customers, the owners of electric automobiles, in a more scientific manner. Thus, instead of making a flat rate to the vehicle owner it is urged that the garage proprietor make a separate item for the energy used in charging the batteries and another for the other service supplied by the garage. The latter may be fixed at a certain amount per month, depending on the character of the vehicle, whether a runabout, carriage, delivery wagon, heavy truck or what not. The charge for electrical energy should be a flat rate per kilowatt-hour at a price which will enable the garage to make a profit. For instance, it is possible that the garage man might sell electricity to his customers at 4 cents per kw-hr. that cost him, under the modern off-peak schedule, not more than 2.5 cents. He would thus sell electricity as needed to the electric-vehicle owners on a measured basis, just as he sells gasoline by the gallon to the owners of gasoline cars.

This manner of doing business has appealed to many

garage proprietors when suggested to them, but one objection urged on the part of the garage keeper is the heavy investment necessary for the individual meters needed to measure the energy supplied to individual customers. To meet this objection the Commonwealth Edison Company has devised the plan of installing such meters and testing them periodically to keep them in running order, making the garage a rental charge for this service of 50 cents a month for each meter. This offer applies to all garages, whether using the company's service or not. A special type of watt-hour meter has been ordered for this service, in which, in addition to the ordinary small dials, there is a larger dial with a pointer which can be set back to zero after each period of battery charging. Thus the meter can be read very easily for each charge. This plan of renting individual meters for garages bids fair to be successful.

## CONTRACT ROUTINE SYSTEM OF DETROIT EDISON COMPANY.

Public service companies are often unjustly criticised for the "red tape" which surrounds their business relations with their customers, although these same customers frequently submit to greater inconveniences by government and civic rules without complaint. To eliminate this phase of sales department work, declared Mr. R. T. Duncan, of the Detroit Edison Company, in a paper read before the Michigan Electric Association recently, standardization is the only hope.

In small companies, said the author, it is comparatively easy to keep track of orders that should have special or prompt attention, but as the demand for service grows no sales department can keep in touch with all orders, so that a system to take care of the work is imperatively needed.

The Detroit system as herein outlined is adequate to handle effectively the present business, averaging 3500 contracts per month, and twice this business if necessary, by simply adding to the night force. The Detroit system makes the meter installation department a division of the sales department and gives the sales department authority over the construction department where their relations with customers are concerned.

When the application is entered in the contract register it is given a consecutive number before orders are issued. The numbering of applications simplifies filing and is an easy and quick method of accounting for contracts.

Several forms of work orders are in use, but all classify in the two prominent systems—multiple and series. In the series system one general order is issued and is passed through the various departments required as the work is completed. In the multiple system several copies of the order are made by use of carbons or a duplicating machine and each department is furnished with one or more copies.

In the distribution of order copies it is advisable to furnish at least two copies to each department. By so doing unnecessary work is avoided in the departments, the foreman filing one copy and giving the other copy to his workman. The original copy is retained by the sales department in its file.

Once each day the various departments return to the office one copy (A) of all orders completed the previous day and also a list of unfinished work with explanations. These reports of unfinished work are at once noted on the office order copy, so that inquiries from customers can be answered instantly by the sales department.

Upon receipt of the copy from the department finally completing the installation—usually the meter-installation department—the office copy is removed from the file pending orders. Each department copy is also posted to the contract register in the column provided. This first order copy is not intended to be a detailed or final report, but simply an advance record furnished as quickly as the work is finished. Generally two or three days are required before the detailed report with records attached is received with the second copy, owing to clerical work to be done in each department. The first copy is obviously of no definite value now, and its disposal is at the discretion of the local management.

One company forwards the meter department copy to the bookkeeper to open an account at once, showing meter number, contract number and date meter was installed. This account acts as a check upon the sales department and helps in locating new installations. The copy can then be passed to the meter-reading department for notation and to the addressograph department for plate. Other copies can be used for immediate canvass, as by leading and utensil salesmen.

The contract, with completed installation records, can then be passed directly to the bookkeeper for entry, without being diverted through several office departments before reaching its destination.

Contracts should always be found in one of two files, "Pending for Execution" or "Contracts in Force," and this rule can be carried out best by a direct route from the sales department to customers' accounts department.

The second copy or official report, with all necessary records, is returned to the sales department as soon as possible, and is attached to the contract. After writing a "customer's index card" for the sales department alphabetical file, the contract is checked with installation records

ADDRESS — APT. NO.

NAME _____ FLOOR
(PRINT IN FULL) (NUMBER) (STREET FACING)

CREDIT _____ ORDERS _____ CURRENT _____ PHASE _____

PAST RECORD REFERENCES _____ LOAD _____ INSTALL DEMANDS _____

_____ TRANS FROM _____ DATE _____ (TO TAKE EFFECT)

SEND BILL % _____ WHEN WANTED _____ BUSINESS _____

KEY FOR READING AT _____ PRIOR TO INST. NOTIFY AT _____ TAKEN BY _____

Fig. 1—Salesman's Information Report.

COPY B

THE EDISON ILLUMINATING COMPANY OF DETROIT

DATE June 10 1912 — James A Smith — NO. 2241
120 Arizona Ave 1st floor

RUN SERVICE Overhd. Dept
INSTALL METERS Mtr Dept
INSTALL ARCS
TEST APPARATUS
LOAD 20-50 Watt Lps 5-30 " " Residence

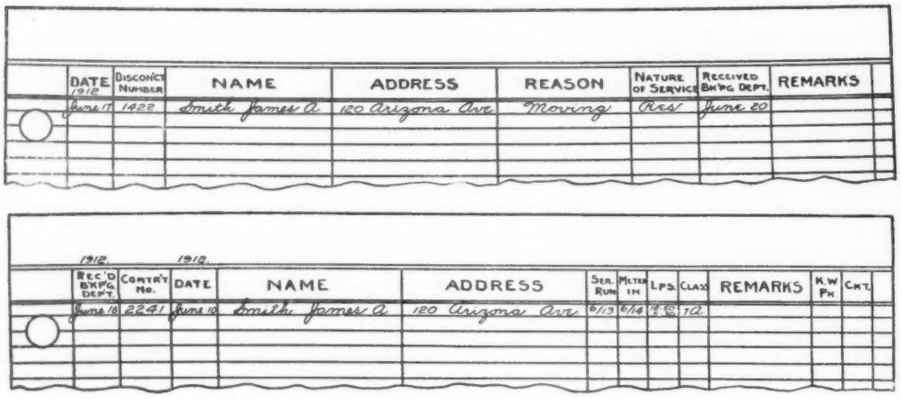
INSTALLATION 18-50 Watt and 5-30 Watt Sem Lamps
BUSINESS Residence D.C. OR A.C. AC-110 V.
IS WIRING COMPLETE? Yes EMPTY SOCKETS No
APT OR ROOM NO. FLOOR First
REPORT Meter # 3422 Installed June 10 1912

DATE June 10 1912 SIGNED John Jones
Foreman Meter Dept

Fig. 2—Work Order. Installation Complete.

and delivered to the customers' accounts department, which gives a receipt for it by number. This receipt is posted in the contract register and then shows the entire history of the order.

All orders for removal of meters should also be issued by the sales department. Where the meter-removal department is the only one doing the physical work, two A and B orders should be given it.



| | DATE 1912 | DISCONCT NUMBER | NAME | ADDRESS | REASON | NATURE OF SERVICE | RECEIVED BM'PG. DEPT. | REMARKS |
|---|---|---|---|---|---|---|---|---|
| | June 17 | 1422 | Smith James A | 120 Arizona Ave | Moving | Res | June 20 | |

| | REC'D BM'PG. DEPT. | CONTR'T NO. | DATE 1912 | NAME | ADDRESS | SER. RUN | METER IN | L.P.S. | CLASS | REMARKS | K.W PH | CKT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | June 16 | 2241 | June 10 | Smith James A | 120 Arizona Ave | 6/13 | 6/14 | 4 6 | 70 | | | |

Figs. 3 and 4—Contract and Disconnect Register Forms.

Before distribution the disconnect order should be entered in a disconnect register and the office copy placed in the "pending disconnect file." The same system of recording progress of work is noted on the office copy as with installation orders.

When disconnection is completed, copy A is returned to the sales department and posted to register, the office copy is removed from file, and the customer's file card, with date of disconnection, is placed in "out" file and disconnection order delivered to bookkeeper to render final bill. The office copy can then be given to salesman to follow for next occupant.

Copy B should contain all information of copy A and be an exact duplicate in report. This copy B can circulate through meter-testing, meter-reading and other necessary departments for notation, and finally be returned to customers' accounts department file.

The foregoing outlines part of the system in use by the Detroit company. This routing could be changed to suit a smaller company, but the idea, as Mr. Duncan recommended, should be fundamentally the same.

A salesman in his ardor to close a contract often neglects to secure necessary office information. To avoid delaying a connection, he should furnish his report on a printed form either separate or as part of the order. The order should be approved by the sales manager or someone designated to pass on its general correctness and acceptability and to have orders issued for the necessary work. The report blanks shown formed part of the paper read at the convention and might with slight modifications be also made serviceable elsewhere.

## DETROIT PLAN OF FINAL INSPECTION.

Much time was formerly lost in connecting service to newly wired houses at Detroit, Mich., between the successive visits of the fixture men, meter setters and city inspectors. A new plan recently put into operation has proved very successful and of great convenience to all parties.

The public lighting commission's representatives make the roughing-in inspections in the usual way. After the fixtures have been placed in position and the job is ready for service the Edison Illuminating Company is notified to set its meter. The meterman completes his installation, tests out the circuits and assures himself that everything is in working order. In advance, the city inspection department has provided him with a number of wire seals of the freight-car type, red tags, etc. After testing out the job the meterman opens the service switch and wraps around its blades one of the seal wires, passing the strands through a red warning tag and sealing the ends in the usual way. As a precaution the fuses are also backed out. The seal wire short-circuits the switch blades and thus makes it impossible to get any service in the house until the seal has been removed by an authorized person. The red warning tag attached recites that the seal may be broken only by an inspector of the public lighting commission, and current must not be turned on without an inspector's approval, under penalty of the city ordinances.

As rapidly as the electric meters are placed the city inspectors are notified. After examining the job and satisfying himself that the work involves no infractions of rules promulgated by the municipality or by the National Fire Protection Association the inspector removes the seal, after which the new service installation is sanctioned and ready for use.

PENINSULAR ELECTRIC LIGHT COMPANY

DISCONNECTION SLIP

DATE June 17 1912 No. 1422

NAME James A. Smith ADDRESS 120 Arizona Ave.

TRANSFER TO

METERS, No: 2621 READING 547 K 1

DEMAND, No: 3626 READING 5 AMP.

No: READING AMP.

| WATTAGE | 10 | 20 | 30 | 50 | 80 | 100 K.E. | 125 K.E. | 187 K.E. | 250 K.E. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAMPS INSTALLED | | | | 20 | 1 | | | | | | | |
| RETURNED OR TRANSFERD | | | | 18 | | | | | | | | |
| SHORT | | | | 2 | 1 | | | | | | | |

STOREKEEPER O.K.

BILL No.

ENTERED AT METER DEPT. DATE June 19 1912 DATE June 19 1912 BY Wm. Doe

O.K. John Jones FOREMAN

Fig. 5—Meter-Department Record After Discontinuance.

## FLATIRON CAMPAIGN IN CHICAGO.

On Aug. 12 1776 electric flatirons had been put out by the Commonwealth Edison Company of Chicago in pushing the special flatiron campaign begun about July 1. The figure given is net, or exclusive of irons returned. It is confidently expected that a total of 10,000 will be reached by Sept. 1. The campaign has been carried on vigorously under the direction of Mr. O. R. Hogue, of the contract department. Advertising announcements have been carried in the daily newspapers, in posters and on the screens of motion-picture shows. The plan provides for the installation of the iron without charge, with free trial for thirty days, and payment in one-dollar instalments at the end of each month after installation, provided the iron is retained. On payment of the full amount, $3, the iron becomes the property of the consumer. General Electric irons are used.

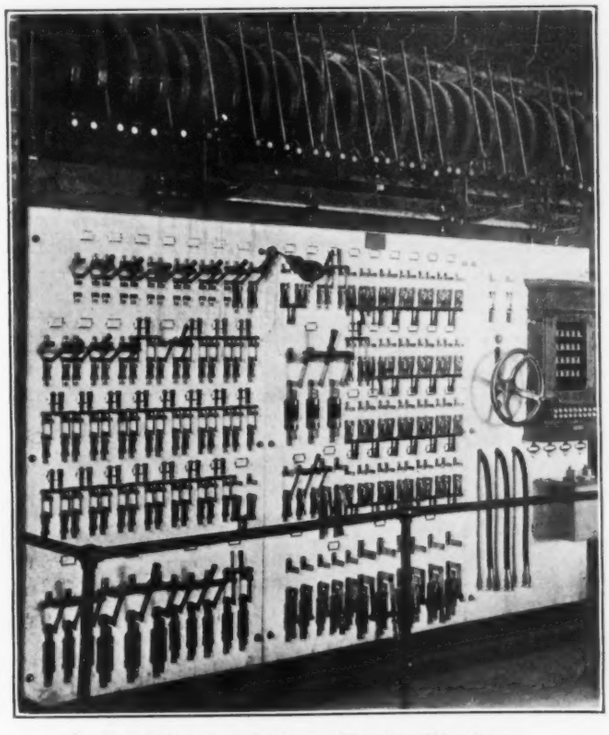
# Wiring and Illumination

## COMBINATION WARNING AND INTERRUPTION REPORT CARD.

Several transmission companies operating extensive systems with remote substations and plants make use of a warning tag, to be hung on open switches where men are working, which is also a post card, ready for mailing to headquarters with a full report of the interruption, after the trouble has been cleared. Red cardboard is used, and the tag bears in large letters the words "Don't close without authority; men working on line." There are also blanks for entering the nature of the trouble, time, time cleared, location of switch, extent of service interruption, authorization, etc. The obverse bears the standard post-card form with printed address of the operating headquarters. Record is thus automatically afforded of each interruption or unusual switching operation for the information of the operating chief.

## ELECTRICAL EQUIPMENT FOR THEATER.

The electrical equipment of the Orpheum Theater, Winnipeg, Manitoba, possesses certain features worthy of note. The main feeders, entering the building from an alley in the rear, are extended to a cabinet located on the so-called fly floor, which contains fuses only, and from here, in 3.5-in. conduit, to the basement, where the main distribution cabinet is located. Extending from this cabinet are branch circuits for the main switchboard, for the box office cabinet



Switchboard of Orpheum Theater, Winnipeg.

and for a cabinet in a waiting-room, for lighting and heating circuits in dressing-rooms, etc.

The main distributing circuit to the switchboard is carried along the stage floor to a main switch located behind the board on the wall in an iron box. Space is provided for working behind the board and the whole is incased in sheet iron. All the stage and auditorium lighting is controlled from this point, and the other circuits for fire exits, foyer and lobby, etc., are controlled from the box-office panel.

On the main board switches are provided for the stage lamps, border lamps, side lamps, foot lamps and stage pocket lamps, and also for the fan circuits throughout the house. These circuits enter a large distribution box at the rear of the board and are then carried in six 2.5-in. conduits to another long rectangular box at the top of the board and from there to the proper switches.

The same idea is applied to the stage-pocket circuits. There are nine stage pockets, four on each side, containing one 50-amp plug and two 25-amp plugs each, and one in the center containing one 25-amp plug.

The four border strips and the foot lighting consist of 100 white, 50 red and 50 blue lamps each. The three banks of dimmers are mounted on top of the switchboard and are controlled by levers. The whole bank is controlled by the master wheel shown on front of the board in the accompanying illustration.

On two panels to the left of the switchboard are mounted the switches for the stage and house lighting. To the right is the signal panel, on which is also located the annunciator for calling the actors. To operate this annunciator the attendant pushes the room number wanted and rings a bell continuously until the answer is given by pushing a button that stops the bell and drops the corresponding number of the annunciator. Program boxes are placed at each side of the stage and are controlled by the dial switch mounted under the annunciator. This dial switch will give any letter in the alphabet, and any number from one to nine. There are also speaking tubes and push buttons on this panel for signaling to the orchestra leader, fly man and boiler-room. The two single-pole switches at the top are for signaling to the orchestra and fly man.

The only motor service in the building is provided by one 2.5-hp, 500-volt, direct-current machine belted to a 48-in. exhaust fan for ventilating purposes.

The electrical equipment for this theater was installed by the Reese Engineering Company, Ltd., Winnipeg, Manitoba, Can.

## RECONSTRUCTION OF OVERHEAD LINES AT NEWARK, OHIO.

It is interesting to note the enterprising manner in which many of the smaller central stations are seeking to build up their loads—not in a spasmodic "revival" style of new-business campaign but simply by using ordinary methods dictated by good common business sense and working at them every day. The Licking Light & Power Company, of Newark, Ohio, furnishes an example of such a plant. For a number of years the company was practically dormant, taking only what business came to it or making spasmodic and unsustained efforts therefor. Recently, however, under the management of Mr. H. L. Montgomery, formerly superintendent of the Auburn (N. Y.) Light, Heat & Power Company, steps have been taken to improve the service and prepare for increased load.

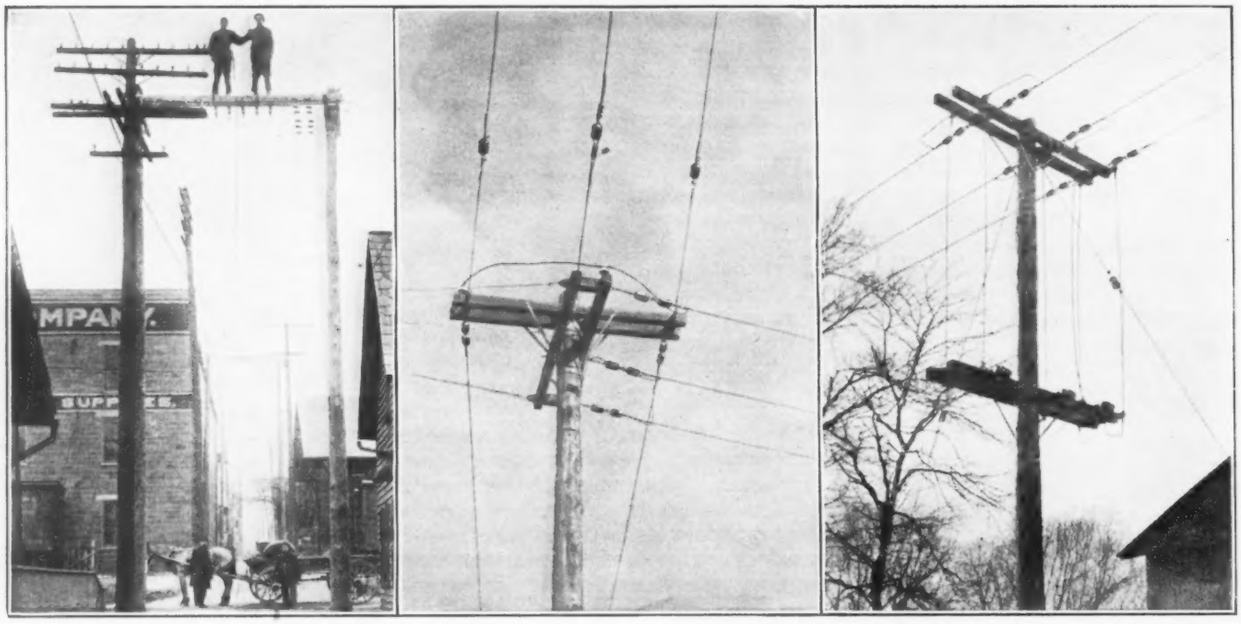
The first point to receive attention was that of the lines. Like so many present-day systems that are simply the outgrowth of smaller ones begun in the early days of the electric-lighting industry, lines were run and transformers installed as they were needed, with the result that there was no system whatever in vogue and the number of transformers in use was very greatly in excess of what it should have been.

The city of Newark, which has a population of about 25,000, is laid out very much on the checkerboard order with the court house in the center, the streets adjacent thereto being the main business thoroughfares.

Desiring to avoid the main streets as much as possible with the pole lines and yet effect an economical system of

distribution, it was decided to use the less important streets and alleys for distribution lines and distribute to the business district from banks of transformers located at convenient points.

The main high-tension line is run from the plant up a side street and taps taken off down an alley, as shown in Fig. 1. As will be seen, cross-arms are used extending entirely across the alley, the telephone company's poles being used in some cases. Where transformers are to be located double cross-arms are used and units of 25-kw capacity installed thereon. By this means a reduction in core loss is



Figs. 1, 2 and 3—Details of Line Construction at Newark, Ohio.

Fig. 4—High-Tension Distribution Line at Newark, Ohio.

obtained by the elimination of a lot of smaller transformers and trouble is much more easily located.

Of particular interest are some of the features of line construction used, the idea having been to build the line for the future and not for the present only. The system is 2200 volts, two-phase, and three-wire distribution is used, though it is intended eventually to change to 4400 volts, three-phase. The high-tension wires are carried on unpainted cross-arms and white insulators, while the secondaries are carried on green cross-arms, thus giving a lineman no excuse for mistaking one for the other. Extensive use is made of strain insulators and guy wires, the idea being to relieve the insulators and pins of all the strain of the wires, this being taken by the cross-arms.

The poles are doubly cross-armed and guyed at every street crossing as well as at every change in direction of the line, and at these points the strain is taken at the pole adjacent, which is well guyed, and the wires over the street or individual pole where the direction changes are left slack. An example of this construction may be seen in Fig. 2, which shows clearly the method employed. By this means the pins and insulators are subjected only to a minimum strain.

Fig. 3 also clearly shows the method of construction used for primary cut-outs, which are placed on a lower cross-arm, enabling the lineman to have access thereto without getting up among the high-tension wires. It will be noted that the pole is guyed both ways and doubly cross-armed and that two strain insulators are placed on each wire which is attached to the cross-arm, leaving the wires running to and from the fuse boxes entirely slack and the insulators free from strain. Fig. 4 shows the high-tension line running along an alleyway parallel to one of the main streets.

## CURBSIDE DOUBLE-THROW FEEDER SWITCHES AT FORT WORTH, TEX.

In laying out the new underground 4400-volt alternating-current distribution system in the business section of Fort Worth, Tex., now being completed in connection with the erection of a new turbine generating station, duplicate main feeder lines have been provided, either one of which can be connected to the branch lines through double-throw oil switches. These 4400-volt, 300-amp. three-phase double-throw switches are normally closed on the main operating feeder, but in case of interruption to service on the latter can be transferred on to the auxiliary feeder. The feeder switches are inclosed in cast-iron pedestals mounted over the edge of the manholes at the alley intersections where

the branch feeders diverge. The pedestal doors are kept locked, keys being carried by the operating staff so that upon interruption the switches can be reached and service restored with the minimum delay.

## CONDUIT SYSTEMS IN CONCRETE BUILDINGS.

By J. P. Morrissey.

A great difficulty presented itself to the electrical trade when concrete construction was first begun; but this has been overcome after many experiments and at great cost to all concerned. In the first building of this construction the electrical work was not started until the concrete had

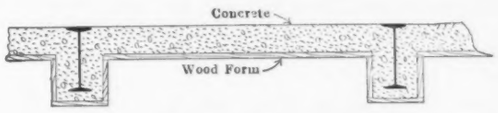



Fig. 1—Concrete Floor Without Conduit.

set, as shown in Fig. 1, and the forms had been removed. Then the outlet location was found and a hole had to be punched, which proved to be a very difficult and laborious task. In a great many instances larger openings than necessary were punched, and this allowed the outlet to lose its proper center. Before all the punching was completed the concrete work was so far advanced that the electrical work had to be pushed to keep up with the other trades.

Loss by experience at this class of work made the contractors cast about for some method of avoiding expensive and laborious punching, and finally a round wood block especially made to suit the construction and location on the wood forms at the location of the outlet was devised, as shown in Fig. 2. These blocks were made with a small diameter at the bottom of approximately the size of an

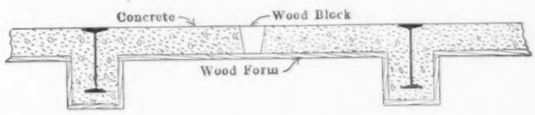



Fig. 2—Provision in Concrete Floor for Outlet.

outlet box and tapering to a larger diameter at the top, so as to prevent them coming out when the concrete forms were removed. The blocks are of a depth to suit the thickness of the concrete slab construction. The concrete is poured after the block is properly set and fastened, and the opening in the concrete slab after it has set and the block has been removed leaves easy access for the installation of the outlet boxes and conduit. These blocks, being specially made for the purpose, are expensive; therefore, much care is exercised in their removal.

After the blocks are removed one method of installing the conduit and outlets is to bring the outlet down flush with the ceiling, thereby necessitating sharp and small bends, depending on the allowable thickness of construction

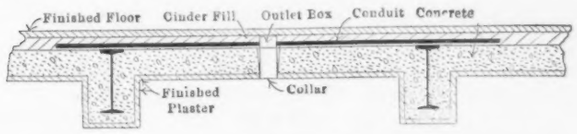



Fig. 3—Method of Bringing Outlet to Ceiling Level.

to the finished floor, so as to prevent its being exposed, as shown in Fig. 4. Where conditions will not permit such installation the outlet box is placed over the opening left by the removal of the block and the conduits are installed running into the side of the outlet box, properly and securely fastened. A sheet-iron collar is then made up of the proper depth and bolted to the outlet box, thereby making a box to the level of the finished ceiling, as shown in Fig. 3. These methods do not prove very satisfactory, and the conduit and outlet boxes are now installed on the forms before the concrete is poured. This is found to give the most satisfactory results and adds greatly to the rapid completion of this class of building. The wood forms are set with the reinforcing wire netting, and upon these the outlet boxes with one length of conduit are located, as shown in Fig. 5. The location for the outlet box is found and a nail is driven into the wood form at the exact center. The outlet box is made up with the fixture hanger securely and properly attached, and the center of the hanger is set over the nail at the outlet location. The box is then fastened to the form with wire nails.

The outlet boxes are deep enough to permit the conduit to enter on the sides. The conduit rests on top of the netting. In a great many instances the conduit actually is a reinforcement to the concrete construction and can be completed back to the distribution box location and be turned up or down at switch locations as conditions necessitate. This gets the conduit located out of harm's way and

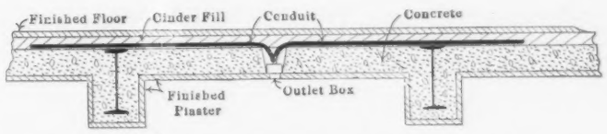



Fig. 4—Method of Installing Conduit in Concrete Floor.

does not permit it to be trampled on or run over with wheelbarrows.

Galvanized iron and steel conduit have been used almost exclusively, and have proved satisfactory as far as results are concerned. The free use of white lead on all joints is a point insisted upon for the best results. The boxes used are also galvanized to withstand the corroding action of the concrete mixture. The wire nails that are used for fastening are so eaten by the concrete mixture that it is not a difficult job to remove them before pulling in the wire. Placing the outlet box flush on the forms brings it almost to the finish of the ceiling, which is very rarely thicker than the face ring which is added to the outlet box after the forms are removed. The fixture hangers, which have proved very satisfactory, are made up of a T fitting, into which a piece of conduit not less than 15 in. long has been inserted and a threaded stem installed, locking itself

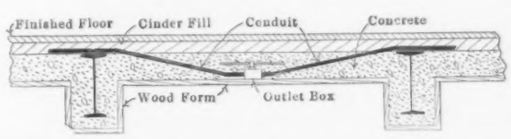



Fig. 5—Box and Conduit Embedded in Concrete Floor.

against the cross head and then being bolted to prevent turning. The stem is made long enough to come half way down in the outlet box, thereby leaving space for the insulating joint. Another fixture hanger that has given satisfaction when properly installed is made up with a "Thomas & Betts" loop head. A length of conduit is installed in the loop and a stem is screwed into the bottom of the loop and wedged against the conduit. A small nail is then driven into an opening for that purpose, which spoils the threads of the stem and prevents it from turning. The McKnight hanger has also given satisfaction, but requires care in installation. This hanger is all made up ready for installation, and it is only necessary to lock it into an outlet box with lock nuts, one on the inside and one on the outside, and then let it stand in a vertical position until the concrete is poured around it. The holding bands are then offset and fastened with nails at the points on the bands made for that purpose.

There have been instances where, because of the conduit being embedded in the concrete, spikes have been driven through the conduit to fasten sleepers for flooring, but the cases are very rare because the more modern floors are of cement finish that do not require any spike driving. There are also instances where concrete has leaked into conduits at joints, but this is a matter of faulty construction that might present itself under any construction where concrete is used. These are the only faults that have presented themselves, and the cases are so few and far between that they are seldom met with twice by the same workman.

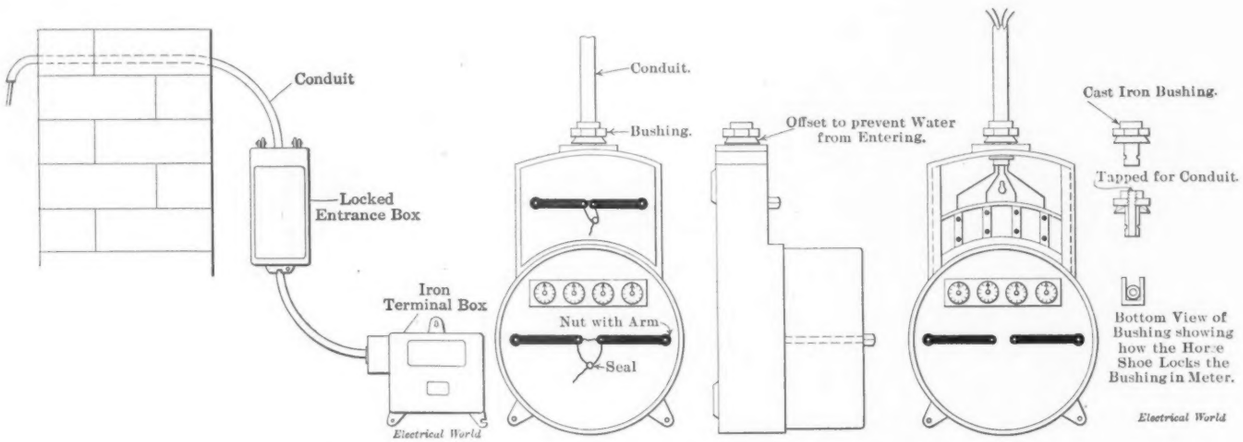
## PROTECTION OF ELECTRIC METERS.

By Robert Montgomery.

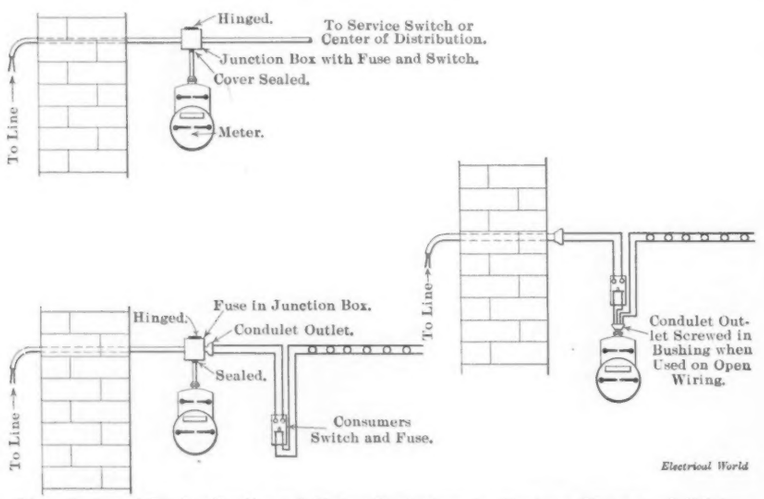
In this electrical age, when almost every one has a smattering of electrical knowledge and every small boy is an amateur electrician, the unprotected meter is as impracticable for the central station as is the open cash drawer for the merchant. In a city of less than 100,000 population an inspection was made recently by one man who detected over 300 cases of theft during a period of three months. In 95 per cent of the cases a jumper of some kind was used, thus shunting out the series coil, or else the shunt wire to the meter was disconnected. Only in a very few cases were holes drilled in the meters or hatpins forced through the cover or case of the meter.

Though a central station may be convinced that a customer is tampering with his meter, practically nothing can be done in the matter unless there is strong evidence. If there is evidence, in most cases the meter is either placed outside on a pole or else it is protected by placing it in a steel cabinet, or in some other manner. There is much to be said against the practice of placing meters on poles, however, aside from the possibility of vibration caused by wind, etc., rendering meters inaccurate because of creeping. In such an attempt to safeguard its interests a company ignores the right of a customer to read his meter, which is not politic. The scheme is not to be commended, therefore, except in rare circumstances. In Fort Worth, Tex., use is made of the arrangement shown in Fig. 1. A small iron terminal box is fastened to the meter in such a manner that it cannot be removed without breaking the seals of the meter, and the entrance box containing the switch is also sealed. This method is very effective, and were it not for the cost and the difficulty of fastening the terminal box to the meter case it would be a very practical arrangement.

The meter manufacturers can furnish a solution to this problem with very little expense by providing every meter with a device for fastening to it a conduit and sealing it, and undoubtedly the first manufacturer who puts such a meter on the market will find it meet with much favor.




Figs. 1 to 4—Devices Used for Protecting Meters at Fort Worth, Tex.




Figs. 5, 6 and 7—Application of Meter Protectors to Various Classes of Wiring.

During the past year many experiments have been made at Fort Worth on devices of this kind. One plan is indicated in Figs. 2, 3 and 4. A meter equipped with an outlet of this kind could be installed in houses already wired in conduit as is shown in Fig. 5. In cases where a residence or other building was wired with open wiring the meter could be arranged as shown in Fig. 6. In places where it was not necessary to protect the meter it could be installed as is shown in Fig. 7.

Referring to Fig. 4, it will be noticed that the arrangement is such that the cast-iron bushing can first be screwed on the conduit and the meter slipped over the bushing. Then the horseshoe device is placed over the bottom of the bushing, thus locking the meter to the bushing in such a manner that it cannot be removed unless the seals of the meter are broken. Another advantage is that the case of the meter would not be strained as it would be should the conduit be screwed directly into it.

The idea of protecting a meter against theft of energy is not new. The device used at Fort Worth, however, differs from those already known to the electrical fraternity.

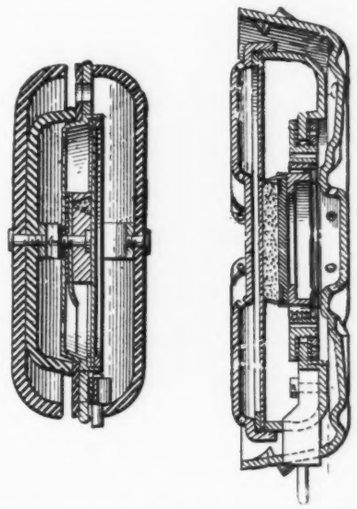
## RECENT TELEPHONE PATENTS.

IMPROVED TRANSMITTERS AND RECEIVER.

One of the most interesting of the more recent applications of the telephone is its adaptation to assist those afflicted with deafness in hearing. While this use dates back a number of years, still considerable work is being done to render the apparatus inconspicuous and at the same time more sensitive. There have recently been issued three patents for audiphone transmitters and all are designed with a special view to these features.

In the cuts are shown sectional views of two of these instruments. That to the left is the invention of Mr. C. E. Williams, of Chicago. It will be noted that sound is admitted through an annular slit which leads to a resonating chamber. Perforations lead from this chamber to a second which confronts the diphragm of the transmitter. The resonators serve to intensify the sounds which find entrance, while the annular sound passage is adapted to overcome to the maximum the danger of complete closure when the instrument is in the pocket.

The instrument patented by Mr. H. G. Pope, of Buffalo, also has an annular sound passage, as is shown in the right-hand cut. This lies in the face of the instrument.



Transmitter for Telephonic or Audiphonic Systems.

It will be noted also that there is a row of openings around the edge of the instrument which are formed with flaring lips. These increase the probability of a clear sound passage no matter where or how the instrument is concealed. Further, both front and rear walls carry raised ribs or are otherwise made irregular to prevent close contact of adjacent fabrics. In Mr. Pope's transmitter the sound is primarily admitted to the rear of the diaphragm. This causes an increase of resistance at the instant of a compression and a decrease with a rarefaction. Thus the connected receiver diaphragm takes a motion in phase with the sound waves rather that in opposition. It is claimed that this produces a special effect. The rear sound passage is divided by internal ribs so that it consists of tapering passageways, with a view to concentrating the sound as it approaches the diaphragm.

A third transmitter for similar use has been patented by Mr. H. E. Schreeve. This is of much simpler construction. The cap piece is of sheet metal and the face is slightly dished and is perforated with numerous small holes. Immediately within lies a mica diaphragm, then a thin carbon diaphragm, over which lies a metal disk with a recessed center. All are clamped by an annular interval nut. The recess in the bridge piece is insulated and within the insulation a carbon block is bolted. This block has several hemispherical recesses which carry carbon granules. The construction is such that the carbon diaphragm and carbon block so nearly touch that the granules are retained in their respective recesses. Mr. Schreeve's patent is assigned to the Western Electric Company.

Another patent assigned to this same company describes an improvement in the construction of watchcase receivers. This improvement is the work of Mr. W. O. Beck, of Weehawken, N. J., and consists of a novel terminal and binding post.

# Letter to the Editors

## POWER-PLANT EFFICIENCY AS DETERMINED BY THE TECHNICAL EDUCATION OF EMPLOYEES.

*To the Editors of the Electrical World:*

SIRS:—In his article on "Power-Plant Efficiency as Determined by the Technical Education of Employees," in your issue dated June 8, Prof. C. M. Jansky presented data from various sources which he interpreted as showing greater efficiency in plants managed by technically educated men as compared with plants managed by men who have not had the advantage of a college education.

In one large plant operated by men without technical education he found the coal consumption to be 14.02 lb. per kw-hr., while in a smaller plant in which two college men were employed the coal consumption was only 8.24 lb. per kw-hr. Prof. Jansky considers that differences in local conditions could not account for the difference in coal consumption, and hence concludes that the better results in the smaller plant are attributable to the technical training of the employees. Attention should be called to the possibility that the larger plant is equipped with slide-valve engines consuming, say, 45 lb. of steam per hp-hr., while the smaller plant might be equipped with Corliss engines consuming only 25 lb. per hp-hr. Moreover, one boiler may evaporate 10 lb. per pound of coal while the other may evaporate only 7 lb.

The writer once replaced a slide-valve engine with a Corliss engine in a municipally owned plant, thereby reducing the coal consumption by about 50 per cent and delivering a kilowatt-hour at the switchboard for about 7 lb. of coal consumed. A much larger plant in a neighboring town operated by an extremely able college man with considerable experience consumed 8 lb. of coal per kw-hr. In this case the rather high fuel consumption was attributable to the fact that a four-valve engine was used. While such an engine is more economical than a single-valve engine, it is not as economical as a Corliss engine.

From Prof. Jansky's article one might be led to believe that only college-trained men are capable of operating a plant economically and that a college-trained man at double wages is a good investment. To be a good operator one should have knowledge of the use of the steam-engine indicator and some knowledge of heat and the chemistry of combustion, and he should be well posted in all the details of plant operation which can be acquired only by experience. The rapidity with which he will acquire this knowledge will be in proportion to the natural ingenuity of the man. It is not now necessary for one to attend college in order to learn the technical part of power-plant operation, for there are books on the market and periodicals in circulation from which anyone with a moderate education may obtain this information at small cost. The writer does not believe that college men are failures as operators, but he does mean to say that there are many good operators who are not college men. It is his belief that an employer runs a greater risk of getting incompetent men when he employs only college men than when he employs only operators of practical experience who are not college men.

*New Egypt, N. J.* LYMAN SHEPARD.

# Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

### Generators, Motors and Transformers.

*Starting of Large Direct-Current Motors Without Series Resistance.*—Carl Trettin.—A continuation of his article in which he shows that it is quite possible to use direct-current motors of some hundred horse-power rating without series resistances and without fear of the bad effect of an excessive starting current. Oscillographic curves are given to show results obtained from tests of propeller motors and elevator motors without starting resistances.—*Elek. Zeit.*, Aug. 1, 1912.

*Single-Phase Commutator Motors.*—R. E. Hellmund and E. W. P. Smith.—The first part of an article in which the authors discuss the useful transformer action in single-phase commutator motors. The authors first take up the series motor with short-circuited compensating winding. They show that the short-circuited compensating winding is always to be preferred to the series-connected winding, except for cases where the motor is to be used on both direct-current and alternating-current circuits. The article is to be continued.—*Elec. Journal*, Aug. 1, 1912.

### Lamps and Lighting.

*The Most Favorable Rate of Operation and Permissible Decrease of Candle-Power of Tungsten Lamps.*—L. Bloch.—The author gives the theory of calculating the rate of operation of an incandescent lamp in watts per candle for which the total cost of operation (energy cost plus cost of renewal of lamps) becomes a minimum. He also shows that for every rate of operation there is a certain decrease of candle-power within life for which the total cost becomes a minimum. This decrease of candle-power is found from the formula $a_{oo} = m \div (m + 2)$, where $a_{oo}$ is the value by which the original candle-power is to be multiplied in order to determine the candle-power at the time when it is best to renew the lamp, and where $m$ is the exponent in the formula which connects the life $T$ with the rate $c$ of watts per candle for a given percentage degree of candle-power, namely, $T = c\, c^m$. For the tungsten lamp $a_{oo} = 0.75$. That is, the lamp should be renewed when the candle-power has decreased to 75 per cent of the original value (it is usual to allow carbon lamps to run until the candle-power has decreased to 80 per cent of the original value). The author also calculates the values of the best rate of operation of tungsten lamps for 10 cp, 25 cp and 100 cp at different prices of energy and different prices of lamps, and finds that for the prices as they are now usual, the best rate of operation for 10-cp and 25-cp lamps is between 1 watt and 1.1 watts per hefner cp. For 100-cp lamps it is from 0.85 watt to 0.95 watt per candle. The minimum in the cost curve is rather flat, and it is shown in a detailed table that the rate of operation can be changed by 0.15 watt per hefner candle above or below the best value, or the permissible life can be changed by 0.12 above or 0.18 below the best value of $a$ without increasing the total cost by more than 5 per cent. Under those circumstances the requirement becomes important not to let the lamps decrease so much in candle-power as to make a visible effect on the total illumination. This is especially important in connection with carbon lamps where, according to the author's calculations, the lowest total cost would be obtained if the lamp was operated at 1.87 watt per candle and a decrease in candle-power of 33⅓ per cent was permitted; but practical considerations prevent this. The author's conclusion for the practice is that, if not at an earlier moment, metallic-filament lamps should be surely removed when they have decreased by 25 per cent in candle-power. The author refers to recent investigations of the National Electric Lamp Association of Cleveland, Ohio, dealing with similar problems and leading to results which are in good agreement with his own, although the subject is treated in a very different way.—*Elek. Zeit.*, Aug. 1, 1912.

*Ductile Tungsten.*—A note on a recent British patent (No. 15,586, July 18, 1912) for improving the strength and ductility of tungsten, granted to the British Thomson-Houston Company, Ltd. (General Electric Company of this country). Lamp filaments formed in the usual way by the paste processes or by alloying with a ductile metal are treated by being loosely packed in a powdered alkaline earth carbide; for example, calcium carbide, contained in an iron tube. Access of air is prevented, and the tube is slowly heated to a temperature of from 850 deg. to 1000 deg. C. during a period of four or five hours. This temperature is maintained for ten or fifteen hours and the tube then allowed to cook slowly for a period of four or five hours. It appears that impurities are thus removed from the metallic tungsten. The beneficial effects may also be obtained by incorporating the carbide with the paste during manufacture, which is otherwise carried out in the usual way. Alternatively 1 or 2 per cent of carbide may be added to dry tungsten powder, which is subjected to great pressure and heated in a stream of hydrogen to near the melting point.—London *Elec. Eng'ing*, July 25, 1912.

*Electric Lighting of Automobiles.*—A. Berthier.—A continuation of his illustrated serial on the use of electricity on automobiles. The present instalment deals with automobile lighting by means of a generator, constant voltage being obtained by automatically varying the intensity of the exciting current according to the speed. First such systems are discussed in which an emf is inserted in the exciting circuit, the current being produced either by a special generator (systems of Loppe, Auvert, Moscowitz, Mac-Elroy, Siemens & Halske, and Verity-Dalziel) or by storage battery (Grob system). The author then discusses systems in which the exciting current is more or less interrupted according to the speed, the mechanism being somewhat similar in principle to the Tirrill regulator (methods of Kull, Aichale, Vickers-Hall, Dick, Eygulm). A description is given of the Carleou generator in which the armature can be displaced parallel to its axle of rotation.—*La Lumière Elec.*, July 20, 1912.

*Arc Lamps.*—A continuation of the long illustrated serial based on recent German patent specifications for arc lamps. In the present instalment various new mechanisms for the regulation of the electrodes are described.—*Zeit. f. Beleucht.*, June 20, 1912.

*Three-Phase Arc Lamp.*—W. Wedding.—An illustrated English translation of his German paper recently noticed in the *Digest* on the Schaeffer three-phase arc lamp.—London *Electrician*, Aug 2,. 1912.

### Generation, Transmission and Distribution.

*Three-Phase System for Ship Propellers.*—Karl Zickler and Rudolf Czepek.—The authors describe a combination of an induction generator driven by a prime mover at constant speed with a converter and a direct-current machine whereby a continuous speed regulation of short-circuited armature induction motors is obtained in a simple and commercial way. The system is especially suitable for regulating the speed of squirrel-cage induction motors driving propellers on shipboard. The arrangement is shown in Fig. 1. The induction generator $I\ G$ is directly driven by the prime mover $T$ with a constant speed. The rotor of $I\ G$ is excited with three-phase currents from the synchronous converter $U$, which is supplied with direct current

from the direct-current machine *A*, which is on the same axle as the induction generator *I G* and the prime mover *T*. The converter *U* and the direct-current machine *A* are excited by means of a source of direct current, for instance, a small direct-current machine on the axle of *T*. By means of the regulating rheostats $R_1$ and $R_2$ the exciting currents can be regulated at will. The switch *U S* permits one to reverse the exciting current of *A* and thereby the direction of rotation of *U*. The main circuits between *A* and *U*, between *U* and *I G* and between *I G* and the propeller motor *M* are made directly without the use of resistors or switches. By means of switch *S* the motor M can be reversed when

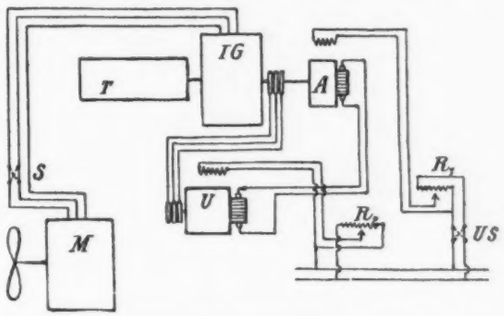



Fig. 1—Three-Phase System for Ship Propellers.

there is no current. The principle of the system is that the induction generator running at constant speed and being supplied with three-phase currents of varying frequency from *U* gives from its stator three-phase currents of continuously changing frequencies. The authors give the theory of the arrangement and the results of tests with special application of the system to the driving of propellers on board ship.—*Elek. u. Masch.* (Vienna), Aug. 4, 1912.

*Direct-Current and Alternating-Current Motors in Steel Mills.*—B. R. SHOVER AND E. J. CHENEY.—A long article giving in a table comparative figures of first costs and annual costs for two systems of modern steel-mill drive, the first being one in which alternating-current motors are used throughout and the second the mixed system, in which alternating-current motors are used for the main rolls, etc., and direct-current motors for some of the smaller drives. The authors conclude that for a rolling mill properly motored, where the percentage of power required for auxiliary apparatus (exclusive of pumps, etc.) is 25 per cent or less of the total power delivered to that mill, and where the power-factor of the entire mill, including both main and auxiliary apparatus, is 70 per cent or over, the all-alternating-current system will show a saving in annual cost, to say nothing of its greater simplicity and more satisfactory operation.—*Gen. Elec. Review*, August, 1912.

### Traction.

*Light Railways.*—R. HAAS.—The author discusses in detail the very satisfactory development of the light railway system of Belgium and compares it with the light railways in Prussia, which are nearly as satisfactory. The economical and legal reasons for this development are analyzed.—*Elek. Zeit.*, July 25, 1912.

*Hamburg.*—G. CUVILLIER.—The first part of a detailed illustrated description of the new Metropolitan railway in Hamburg, Germany.—*La Lumière Elec.*, July 20 and 27, 1912.

### Installations, Systems and Appliances.

*Dangerous Overvoltage.*—F. KLOST.—A critical discussion of the possible sources of dangerously high voltages which may occur in a network, with criticisms of some protective devices in use. The author discusses especially the use of condensers, the action of which he thinks is to be found less in the annihilation of the oscillations than in the increased capacity of the network and the simultaneous reduction of the frequency of the free oscillations. He emphasizes that great precautions must be taken in the insertion of capacities in a network.—*Elek. u. Masch.* (Vienna), July 21, 1912.

*High-Frequency Oscillations in Electric Networks.*—G. GILES.—Atmospheric discharges or the sudden opening or closing of a circuit or sudden load fluctuations cause transient phenomena which may result in dangerously high-voltage waves being propagated along a network. The author investigates the action of a capacity used as a protective device and shows that it changes the form of the wave. It does not annihilate the energy of the wave nor is this necessary for protection.—*Elek. u. Masch.* (Vienna), July 21, 1912.

*Voltage Regulation.*—F. W. SHACKELFORD.—An article on the advantages of the installation of a generator automatic voltage regulator, preferably when constructing the station. It obviates the necessity of carrying the lighting and motor loads on separate mains and results in considerable economy. For larger systems, possessing many feeders, it is further necessary to regulate the voltage of each feeder independently. Several methods for accomplishing this regulation are outlined in the article. The author also offers some suggestions, with diagrams, for laying out a new system of distribution or for reconstructing an old one.—*Gen. Elec. Review*, July, 1912. In a second article on the same subject the author takes up the question of voltage control on alternating-current feeders by means of the automatic-feeder voltage regulator. Seven arrangements of this regulator for feeder use are described, one for single-phase systems, four for three-phase systems and two for quarter-phase systems. The general usefulness of the regulator as a voltage balancer is illustrated in the account of the tying in of the Oakland station of the Great Western Power Company with the Fulsom station of San Francisco.—*Gen. Elec. Review*, August, 1912.

### Wires, Wiring and Conduits.

*Cable Connector.*—A. KASTALSKI.—The Leipzig municipal electricity works have designed a cable connector for utilization in places used for fairs, conventions, etc., and from which temporary lighting connections can be made. Its external appearance is similar to that of a water hydrant. Thirty such connectors have recently been installed, from which a surface of 12,000 sq. m can be supplied with direct current at $2 \times 220$ volts.—*Elek. Zeit.*, July 18, 1912.

### Electrophysics and Magnetism.

*Transient Phenomenon on Opening a Circuit.*—K. MEYER.—An article supplementing another recent article on the same subject. When a circuit is broken by a switch and the resistance is infinitely large at the end of the switching operation the current is zero at the end of the operation. If, however, the resistance of the circuit has a finite value the current has also a finite value depending on the length of the switching period. This value of the current is larger than would follow from Ohm's law for stationary conditions. The current subsequently decreases gradually while the resistance remains constant. The equations of this phenomenon are given.—*Elek. u. Masch.* (Vienna), July 14, 1912.

*Rectifying Effect.*—H. ROHMANN.—If an alternating-current voltage $v = \cos 2\pi n_1 t - \cos 2\pi n_2 t$ is impressed on the terminals of a conductor which does not obey Ohm's law the resulting current has a direct-current component which depends in general on the ratio of the two frequencies $n_1$ and $n_2$. If $n_1$ is maintained constant and $n_2$ is varied, then the direct-current component will be a maximum for certain values of $n_2$. The author investigates mathematically the position and the amplitude of the maxima in their relation to the characteristic voltage-current curve for the conductor employed. The results are confirmed experimentally in a qualitative way by means of a Geissler tube.—*Phys. Zeit.*, Aug. 1, 1912.

*Vibration of a Lecher System.*—F. C. Blake and Charles Sheard.—In a former paper the authors described some experiments performed on a Lecher system using a Paalzow-Rubens bolometer. The present paper is a continuation of that work, but instead of a bolometer a thermal couple was employed. The results given in the present paper show that both forced and free oscillations can exist simultaneously upon the Lecher system and that the overtones of the oscillator are related to each other as the odd numbers, while the free overtones of the Lecher system are related to the fundamental as the natural numbers. When the two circuits are in resonance only the odd harmonics are present to any appreciable extent. The influence of the receiver upon the wave-system was studied, both "selective" and "non-selective" receivers being used. When the oscillator and Lecher circuits were in tune with each other and with the first overtone of the receiver the ratio of "loop strength" to "node strength" was found to be 325 to 1. It was found that under certain conditions the Lecher circuit and either of the other circuits behaved in part as a single circuit, and in one case all three circuits vibrated as a single circuit. It has been shown that to the first order of approximation the currents in the Lecher system can be considered either as longitudinal or transverse, the bridge current being practically non-inductive. To the same degree of approximation Abraham's theory can be said to hold. For the second order of approximation Drude's theory of standing waves explains the facts better, though an entirely satisfactory theory must consider the induced currents in the second half of the Lecher system. By applying Drude's theory the coefficient of damping of the oscillator was measured, the method being the very convenient one of measuring the internodal space shortening.—*Phys. Review,* July, 1912.

*Diffusion of Alkali Salt Vapors in Flames.*—H. A. Wilson.—An account of experiments undertaken with the object of finding the coefficients of diffusion of alkali salt vapors in a Bunsen flame. The results obtained on the ionic velocities, coefficients of diffusion and conductivities of salt vapors in flames seem to agree with the view that the positive ions consist of metal atoms having charges about three times the charge on one hydrogen ion in solutions. At the same time the possible error in the determinations of all these quantities is large, so that it is possible, but improbable, that the charge per ion is in reality equal to that on one hydrogen ion.—*Phil. Mag.,* July, 1912.

*Chemical Compounds of Short-Lived Radioactive Elements.*—H. Schrader.—An account of an investigation in which the volatilization of actinium *B* deposited on platinum was measured in a high vacuum and was found to take place between 600 deg. and 900 deg. C. By allowing chlorine, bromine, hydrobromic acid and hydriodic acid to act on the active material its volatility can be increased. The *B* and *C* products of the active deposits of radium, thorium and actinium condense in an atmosphere of hydrogen and at a temperature several hundred degrees lower than in air. This has been explained by the formation of chemical compounds.—*Phil Mag.,* July, 1912.

*Resistance of Powdered Conductors.*—A. A. Somerville —An article which gives in diagrams the results of experiments on the variation of the electric resistance of powdered carbon and powdered silicon with variation of the temperature within wide ranges.—*Met. and Chem. Eng'ing* August, 1912.

*The Self-Demagnetization of Steel.*—S. W. J. Smith and J. Guild.—An abstract of a British Physical Society paper. The constituents iron and iron carbide are easily traceable in annealed steel, owing to the differences between their magnetic properties. The ferromagnetic transition point of the carbide is about 500 deg. C. lower than that of the iron. The carbide is also magnetically harder at ordinary temperatures and possesses greater coercive force; although, like iron, it is magnetically very soft at temperatures near the transition point. In consequence of these facts, the effect of heat upon the residual magnetism of an annealed steel rod is peculiar and at first sight mysterious. As the temperature rises the residual magnetism falls continuously until it becomes zero in the neighborhood of 200 deg. C. It then changes sign and reaches a maximum negative value at about 220 deg. C. Beyond this, the negative magnetization decreases slowly, and it finally becomes imperceptible between 700 deg. and 800 deg. C. If the rod is cooled from 800 deg. C., it remains without perceptible polarity as the temperature falls; but if the heating is interrupted before the whole of the residual magnetism is destroyed the behavior on cooling is quite different; thus, to quote one case, the rod was heated until, at 600 deg. C., the residual intensity of magnetization was about — 0.5. On cooling, the intensity increased to a maximum negative value of about —1.6 at about 245 deg. C. Then the magnetization began to fall, reached zero at about 210 deg. C., became positive and, finally, was about + 15.5 at the air temperature. An explanation of these and other results is that the residual magnetism of short annealed steel rods is determined by the retentivity of the carbide and the residual polarity of the iron is negative. The iron may thus be said to contribute less than nothing to the residual magnetism of the rods.—London *Electrician,* July 19, 1912.

*Dielectric Hysteresis at Low Frequencies.*—W. M. Thornton.—A British Physical Society paper in which the author makes an attempt to determine from dielectric hysteresis loops the nature of the change of polarization which gives rise to the absorption of energy. Current and voltage wave-forms in large condensers were oscillographically recorded at a frequency of 36 cycles a second. Certain substances, like glass or gutta percha, are found to show a marked triple-frequency harmonic in the current wave, out of phase with the fundamental. Most of these have a low power-factor; others, like presspahn, show little distortion but have a high power-factor. The loops for the former have straight parallel sides and a true hysteresis retardation as the voltage begins to fall; the latter have lens-shaped loops corresponding to a purely viscous retardation. Every variety of transition is observed between these extreme types. The cause of the former would appear to be inter-attraction between the induced molecular charges, which reaches a maximum when these are greatest —that is, at the highest voltage; that of the latter is a resistance to their movement through the substance during the establishment of the usual polarization, the retardation reaching a maximum when the rate of change of the voltage is greatest—that is, in passing through zero. The dielectric constants of substances with lenticular loops are more affected by change of frequency than are the straight-sided type, that of presspahn changing from 4.3 at 78 to 6.3 at 15 cycles per second. Ebonite and paraffined paper, on the contrary, changed by less than 1 per cent throughout the same range. For the same substances change of voltage gradient, short of breakdown voltage, has little or no influence on dielectric constant at this frequency. Power-factor appears to increase with frequency within the range determined.—London *Electrician,* July 19, 1912.

### Electrochemistry and Batteries.

*Electric Furnace.*—R. S. Wile.—An illustrated description of a simple electric furnace for the determination of tin dross, concentrates from cyanide mills and other metallurgical work.—*Met. and Chem. Eng'ing,* August, 1912.

### Units, Measurements and Instruments.

*Self-Adjusting Prony Brake.*—J. D. Coales.—A description of a new type of Prony brake which obviates the use of a spring balance by a simple device which compensates the variations in friction between the brake and brake pulley and automatically adjusts the pressure of the brake belt, so that the torque is maintained at a constant value which is

independent of variations of the speed over wide limits. The torque is put on and measured entirely by dead weights, and is thus perfectly definite.—London *Electrician,* July 19, 1912.

*Determination of Very High Temperatures.*—G. A. SHOOK.—After the discussion of the radiation laws of Planck and Wien he describes methods of reducing incident energy by a certain fraction so as to extend the scale of a pyrometer and discusses this principle with reference to the high-temperature scales of the Le Chatelier pyrometer, the Wanner pyrometer and the Holborn-Kurlbaum pyrometer.—*Met. and Chem. Eng'ing,* August, 1912.

*Comparison of Capacities.*—ALBERT CAMPBELL.—A British Physical Society paper on a method of comparing capacities at various frequencies under conditions of charge and discharge similar to those used in the Maxwell commutator method. A rotating double commutator is arranged (Fig. 2) to charge and short-circuit each condenser simultaneously, the resistance $R$ and $S$ and the frequency being such that the charge and discharge are practically complete for both $K_1$ and $K_2$ in each cycle. The galvanometer must be of a long period. First assume that the two commutators are so mechanically perfect that their corresponding contacts are made simultaneously. When $K_1$ and $K_2$ are of the same type as regards absorption and leakage, the current through

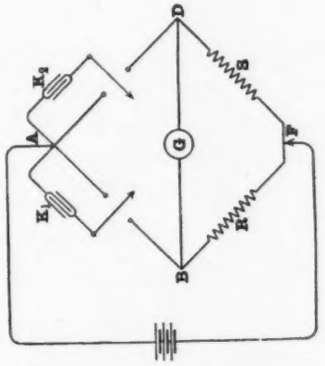



Fig. 2—Comparison of Capacities.

the galvanometer will be practically zero at every instant if $R/S = K_2/K_1$. If the condensers are not of the same type an alternating current will pass through the galvanometer, but, by suitable adjustment of the ratio $R/S$, the mean current can be brought to zero and an exact balance obtained. To a near approximation the relation $K_2/K_1 = R/S$ does hold good. However, it is not possible to insure that the two commutators start the charging of each condenser at precisely the same instant, and thus, to eliminate any errors due to the difference between the two commutators, a second balance should be taken with the commutators interchanged. The mean of the two results gives the ratio of the capacities to a high degree of accuracy. The truth of this statement has been established by experimental evidence. The advantages of this method are that alternating current is not required and that, as a direct-current galvanometer is used, very high sensitivity can be attained.—London *Electrician,* Aug. 2, 1912.

*Meters.*—M. WIESENGRUND.—A paper read before the Electrical Society of Vienna on the latest designs of meters of the Isaria Electro Company. Several special features of the design are first described. The author then refers to the fact that in three-wire meters in which the neutral wire does not enter the meter the burning out of a fuse in one outer may cause the armature of the meter to be without current so that no energy consumption will be registered although the other half of the network carries current. The author describes a relay which in this case changes the connections automatically in such a way that the meter shunt is now connected between the neutral wire and the other outer which carries current so that the total energy consumption is registered. The author then describes an amp-hour meter with compensation for friction; a mercury meter based on the principle of the Barlow wheel; a tramway meter which registers the time when current is supplied to the car; a slot-machine prepayment meter; a meter which registers only the consumption in excess of a fixed number of watts, a flat rate being charged for the consumption up to that number; finally a maximum demand meter and a meter which gives directly the cost of the energy in dollars and cents.—*Elek. u. Masch.* (Vienna), July 28, 1912.

### Telegraphy, Telephony and Signals.

*Inductive Tuner.*—J. O. MAUBORGNE.—An illustrated article on the operation of inductively coupled receiving sets in wireless telegraphy. Tests were made with (1) the inductive tuner alone, (2) the inductive tuner with variable condenser in secondary circuit for the purpose of tuning it, (3) the inductive tuner using a variable-capacity air condenser in series with the primary of the tuner (secondary circuit untunable), (4) the inductive tuner having a variable air condenser in parallel with the primary of the tuner (secondary circuit untunable).—London *Electrician,* July 19, 1912.

# Book Reviews

KONSTRUKTION, BAU UND BETRIEB VON FUNKENINDUKTOREN. Part I. Berlin: F. & M. Harrwitz. 48 pages, 59 illus. Price, 1.25 marks.

A very practical little treatise on the design and construction of high-tension Ruhmkorf coils, especially as applied to X-ray application. The book is divided into five chapters relating to the following topics: Introduction, elements of mathematical theory, physiological induction apparatus, small induction coils, large induction coils. Although a chapter is devoted to the mathematics of the subject, yet the strong points of the book are in the descriptions of practical construction. A short but useful bibliography of the subject is included.

TOLL TELEPHONE PRACTICE. By J. Bernhard Thiess, B. S., LL.B., and Guy A. Joy, B. E., with an introductory chapter by Frank F. Fowle, S. B. New York: D. Van Nostrand Company. 410 pages, 271 illus. Price, $3.50 net.

As the title suggests, this volume presents a treatment of one of the major branches of telephony, and it is especially strong on equipment and systems. It is well illustrated and written in a style intended for men of practical training. The chapters devoted to apparatus are noteworthy for the care with which each detail of operation is described, and in this respect the book should be unusually valuable to telephone engineers, designers of equipment, plant superintendents and equipment maintainers. So-called simplex and composite systems, for simultaneous telephony and telegraphy, are well described. The chapter on line construction, although somewhat conventional in its method of treatment, covers the ground with considerable thoroughness. In treating the topic of electrical reactions in long telephone lines the authors seem less familiar with their subject, and from the standpoint of the transmission engineer the discourse leaves the reader somewhat short of his goal. The chapters on cross-talk and transpositions and on methods of line testing are quite satisfactory. Maintenance is very inadequately treated, however, and the important subjects of traffic and operating methods are not covered at all. Taken as a whole, the volume is a commendable undertaking and forms a worthy addition to the better class of literature on telephony.

# New Apparatus and Appliances

## FIXTURE LOOPS.

By means of a brass rosette, chain and lamp cord, brass socket and two fixture loops it is possible to make a neat and inexpensive fixture for an incandescent lamp. Fixture loops for this purpose are made by Pass & Seymour, Inc., of Solvay, N. Y., and are shown herewith. One of these is

Fixture Loops.

designed to fit a standard ⅛-in.-cap socket, and the other loop has a long shank comp'ete with brass nut for use with the firm's rosette. The chain and lamp cord may be purchased in any length from fixture manufacturers, and the whole assembled in a remarkably short space of time.

## CORD SWITCH FOR PORTABLE DEVICE.

A cord switch at the table provides convenient means for controlling the circuit to heating devices, since it eliminates the necessity of getting up to operate a fixture socket or for pulling a base plug. The brass-shell cord switch made by the Cutler-Hammer Manufacturing Company, of Milwaukee, because of its small dimensions and polished nickel finish is particularly suited for use with heating devices at the

Cord Switch.

table. Convenient operation is provided by simply pushing the button of the switch placed near the device. When used with electric irons it saves the wear on the socket and allows easy and frequent opening and closing of the circuit. The conductors pass through the switch, bushings being provided in both caps, and the ceramic insulating material developed by the company is used as the body of the switch. This material is tough and holds in alignment the small compact operating mechanism, which is similar to that used in the "Acorn" pendent switch recently marketed. The switch is made in 3 amp, 250 volt, and 5 amp, 125 volt, ratings and is said to have been passed by the Underwriters.

## CLEANING PAPER MONEY BY ELECTRICITY.

During the recent "Made in Chicago" display by individual merchants and manufacturers of that city the Hurley Machine Company made an interesting and unusual exhibition in the show window of its Jackson Street store. The demonstration consisted in washing and ironing paper money in much the same way as is done by the United States Treasury at Washington. Soiled bills of various denominations were placed in a Thor electric washing machine and agitated in soapsuds for five or ten minutes. The attendant next rinsed them in clear water, afterward passing them through a Thor electric ironing machine in which electricity is used both for motive power and heating. The operation proved a great attraction to passers-by.

## ELECTRIC COMB AND HAIR DRIER.

The new electric hair drier illustrated is made in the form of a comb and is particularly useful for drying the hair quickly after shampooing. It is also used by women for waving the hair. The comb is of aluminum, and the heating element is designed so that the device cannot be-

Comb and Hair Drier.

come hot enough to burn the hair. A flexible cord fastened to the handle permits connection to a source of electrical energy by means of an attachment plug. The sockets of either 110-volt or 220-volt circuits may be utilized. This comb is the invention of Mr. Edward Schwartz and is made by William E. Slaughter & Company, 1712 South Michigan Avenue, Chicago.

## DEVICE FOR DETECTING OILY EMULSION.

The presence of oil in boilers being recognized as dangerous and the removal of emulsion from water being quite difficult, the detection of oil in boiler-feed water is important, especially if it is possible to use condensate, which, barring the presence of oil, is otherwise chemically pure water. A device for detecting oily emulsion, known as the Martin test tube, is marketed by the Harrison Safety Boiler Works, Philadelphia. The elongated test tube is made of clear glass except at the bottom, which is opalescent and has a small black dot in the center. A small quantity of the condensate to be tested is poured into the test tube under well-diffused daylight until the black dot just disappears from view. The graduations on the tube opposite the level of the water indicate the amount of oil in grains per United States gallon.

Tube for Detecting Oily Emulsion.

If the tube is viewed by electric light a higher result will be indicated than by natural light. Precautions should be taken that no form of precipitated organic matter is suspended in the water. The process does not differ materially from that employed for measuring the amount of matter in suspension in natural water supplies. In looking into the tube filled with clear water the light received by the eye comes entirely from the white porcelain bottom of the test tube, no light coming from the space occupied by the black spot. When, however, the tube is filled with water containing some particles in suspension the light coming through the sides of it reaches the eye, while at the same time the light coming from the white bottom of the tube is likewise deflected and

dispersed so that less of it reaches the eye. When so much water is poured into the tube that only a dispersed light is seen the eye is unable to distinguish the black spot from the surrounding white field, which gives the measurement desired.

## LARGE VERTICAL SYNCHRONOUS-BOOSTER, COMMUTATING-POLE ROTARY CONVERTERS.

Two 3000-kw vertical synchronous-booster, commutating-pole rotary converters have just been built and tested by the Westinghouse Electric & Manufacturing Company in its East Pittsburgh works. These two machines, which are of unusual interest because they are the largest vertical rotary converters ever constructed and because they are the only vertical converters ever built involving the synchronous booster and commutating-pole features, are for the New York Edison Company for installation respectively in its Clinton and its Crosby Street substations.

The converters deliver a normal direct-current voltage of 270 and are for 25-cycle, six-phase operation. The direct-current voltage variation obtained by virtue of the booster feature is 15 per cent buck and 15 per cent boost from the normal voltage, giving a total direct-current voltage variation of 30 per cent. These machines were made

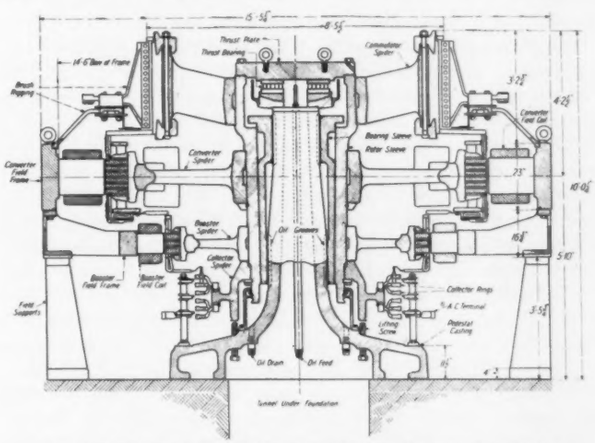


Fig. 1—Sectional Elevation of 3000-kw Rotary Converter.

of the vertical type to conform in general construction to the other converters in the substations, all of which are vertical machines.

The sectional drawing shows the detail construction of the machines. The converter armature and frame are mounted above the booster armature and frame. The commutator is at the top of the machine and the collector rings are at the bottom. The armature is of the usual construction mounted on the same shaft with the smaller booster armature, which is connected in series with the converter armature so that when the booster-field excitation is varied the alternating-current voltage impressed on the converter armature will be decreased or increased accordingly.

The main or converter poles are shunt-wound. The commutating poles which lie between the main poles have been so wound that variations in armature reaction introduced by the booster are taken care of. The copper grids embedded in the main pole faces do not extend from pole to pole as in ordinary machines, but are cut off flush with the sides of each main pole. This construction is used on all commutating-pole converters and forms the most effective starting and damping winding. The booster poles are shunt-wound and the booster field is arranged for hand regulation. Provision is made for effectively cooling the commutator by the insertion of copper heat-radiating vanes in the upper end of each commutator bar. Ample space is provided between the commutator necks, which extend from the commutator bars to the armature coils, and through these spaces the cooling air is forced by the rotation of the machines.

A commutating-pole converter which is to be started from the alternating-current end must be provided with a brush-lifting device, but inasmuch as these machines are to be

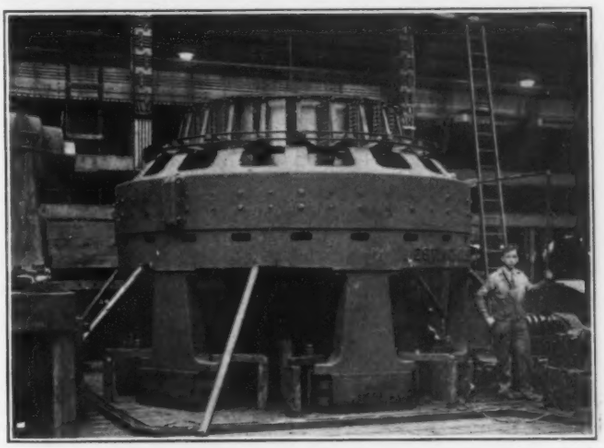


Fig. 2—Vertical Rotary Converter Unit.

started from the direct-current end, a brush-lifting arrangement is not necessary.

Some of the mechanical constructional features are unique. The pedestal on which the armature rotates is a one-piece hollow steel casting having a large area of base. With this construction a rigid structure results. The pedestal is tapered so that the upper bearing is smaller in diameter than the lower one, which facilitates assembly. The bearings proper are babbitted and cast in a sleeve which can be readily taken out of the converter spider for re-babbitting.

A roller thrust bearing is arranged at the top of the pedestal to take the weight of the revolving element. The bearing rests on a plate which has a spherical seat carried on the pedestal so that alignment is assured. The roller bearing can be taken out by removing the top plate of the machine. To assume the weight of the rotating part at times when it is necessary to remove the top plate, six

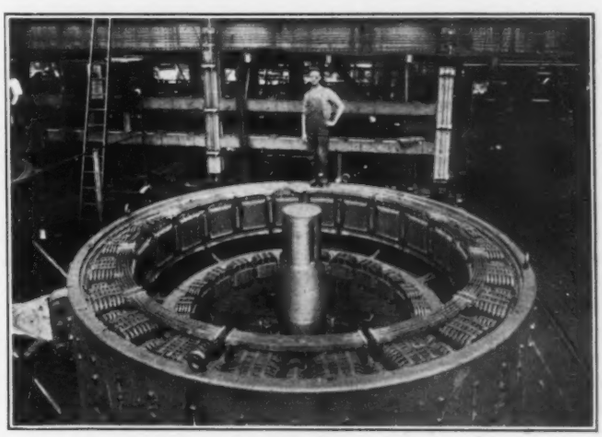


Fig. 3—Field Structure of Rotary Converter.

1¾-in. bolts are provided that turn through the lower portion of the pedestal flange. When it is necessary to take off the top plate these bolts are screwed up until they raise the rotating element a trifle and assume its weight.

Lubrication is effected with a gravity oiling system. The oil is drawn from reservoirs and forced up through the oil pipe in the center of the pedestal. At the top of the pedestal the oil discharges through a nozzle into a cylin-

drical chamber within the roller bearing. The pressure on the oil forces it from this chamber out between the bearing rollers into an annular pan surrounding the roller bearing. Oil cannot leave the chamber except through the bearing, and the height of the outlet nozzle and the oil pan rim is such that the bearing rollers always travel in a bath of oil. When the oil overflows from the pan around the

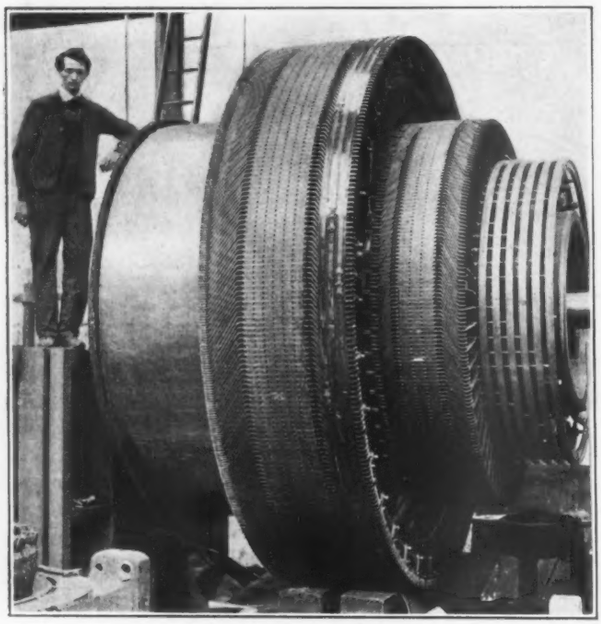


Fig. 4—Armature of Rotary Converter.

roller bearing it passes into an annular chamber just above the upper pedestal bearing. From this chamber its only exit is through oil grooves in the pedestal. While it is passing through these grooves the rotating babbitt-bearing surfaces take up oil. From the upper pedestal bearing the oil flows down through the chamber around the shaft to oil grooves for the lower bearing similar to those above described. From the lower oil grooves the oil discharges into an annular reservoir to the lower part of the pedestal, from which it drains into a storage reservoir, to be circulated again through the lubricating system. An effective oil-thrower arrangement is provided at the upper part of the oil space and around the lower part of the pedestal which effectively prevents oil creepage up the shaft.

## LARGE ELECTRIC MINE HOIST.

In the mine of the Christopher Coal Mining Company, recently organized at Christopher, Franklin County, Ill., will be installed what is held to be the largest electric mine hoist in America. The mine is to be operated entirely by electricity and about half the output of the plant will be required for the hoist. Power for the several operations will be generated at the mine by two 750-kw, three-phase, 60-cycle, 2300-volt Curtis turbo-generators, for which excitation will be furnished by a 15-kw, 125-volt turbo-exciter set.

Above ground practically all the machinery, except the hoist, will be operated by alternating-current motors, while all the underground equipment is to be operated by direct-current motors which will be supplied with energy from three 300-kw synchronous motor-generator sets, each composed of a 430-kva, 2300-volt synchronous motor, a 300-kw, 275-volt compound-wound direct-current generator and a 7.5-kw, 125-volt direct-connected exciter. These units can also furnish approximately 700 wattless kva and will be made use of to bring the power-factor nearly to unity.

The hoist operates on the Ilgner system and is of the double-drum type, having 7-ft. drums designed for an effective load of 9000 lb. in a car and cage the combined weight of which is 11,000 lb. Wire hoisting rope 1⅜ in. in diameter is used. The equipment is being built to make 1000 trips from a 600-ft. depth in seven hours. The cycle arranged calls for six seconds acceleration, nine seconds at full speed, six seconds for retardation and four seconds loading and dumping, which corresponds to a maximum rope speed of 2400 ft. per minute.

An 1150-hp, 550-volt direct-current motor drives the hoist and is directly connected to the drum shaft by a flexible coupling. This motor is designed especially for hoisting service and has large overload capacity. Power will be supplied to the motor by a flywheel motor-generator set, consisting of a 650-hp, 2300-volt induction motor, an 880-kw, 550-volt generator, a 17-kw, 125-volt exciter and a 22,500-lb. flywheel. This unit operates at 600 r.p.m. It is interesting to note that, through the Leonard method of control and the application of the flywheel, it has been possible to decrease the sizes of the hoist motor, generator and induction motor progressively contrary to usual practice.

The speed and direction of rotation of the hoist will be controlled by a controller at the operating platform, by means of which the voltage and polarity of the generator will be governed. The efficiency of this form of control, called the Leonard control after its inventor, H. Ward Leonard, is very high, as there are no rheostatic losses except the comparatively small ones in the field circuit of the generator. Fluctuations of the hoisting load are smoothed out by means of the flywheel and an automatic rheostat in the circuits of the induction motor.

The torque of the regulating motor varies with the line current, and when this current tends to exceed a predetermined value the torque of the regulating motor will overcome the weight of the moving parts of the rheostat, introducing resistance into the rotor circuits of the main induction motor, thereby causing the motor to slow down and allowing the flywheel to give up its energy. When the current tends to fall below the predetermined value the weight of the moving parts of the rheostat will exceed the torque of the motor and the resistance will be cut out automatically. The weight of the moving parts of the rheostat is counterweighted for purposes of adjustment. In the control equipment are also included protective devices to guard against damage from overwinding, failure of alternating-current supply, loss of exciter voltage, loss of air pressure for the brakes, as well as extreme overloads. Both service and energy air brakes are provided.

The hoist is to be of the Ottumwa Iron Works make, and all the electrical apparatus is being furnished by the General Electric Company.

## ELECTRICITY IN THE MOTION-PICTURE INDUSTRY.

In the motion-picture industry, which has now assumed large proportions, electricity plays a prominent part. Wherever a supply circuit is available electric arcs are almost invariably the source of illumination in the projectors used in motion-picture theaters. It is customary to employ hand-regulated arc lamps for this purpose, the beam of light being projected through a small aperture before which the strip of film containing the photographic pictures is drawn at a rapid rate. A rapidly revolving interrupter and a magnifying lens are also essential features of the machine. The film reels are usually operated by hand, although motion-picture machines operated by electric motors are coming into greater use following a recent modification of the Underwriters' requirements. As the celluloid films are very inflammable, every precaution is taken to make the moving-picture machine and its surroundings fireproof.

Motion-picture theaters are frequently liberal users of electricity for spectacular exterior lighting and are usually ventilated by electric fans. Thus these modern purveyors of entertainment at popular prices require a considerable amount of electrical energy and electrical apparatus. The individual installation is not of large size as a rule, but, as there are tens of thousands of these small theaters scattered over the country, the aggregate demand is large.

The energy, vigor and enthusiasm of this comparatively recent industry was shown at the second annual convention of the Motion Picture Exhibitors' League of America, which was held at the Hotel LaSalle in Chicago last week. This organization is formed of proprietors and operators of motion-picture theaters, manufacturers and dealers not being eligible to membership. It has a large number of members, there being 360 in the Chicago branch alone. The organization aims to promote and conserve the interests of the "photo-play" theaters. A number of manufacturers made exhibits in the hotel during the convention, and several of these were of electrical interest.

One room was occupied by the General Electric Company, which had on exhibition a lens lamp (used principally for spotlight effects), various types of electric fans, an ozonator, a long-burning inclosed flame-arc lamp, a rectifier panel and other forms of electrical apparatus for theaters.

The H. M. Hirschberg Company of New York exhibited the Siemens 1912 model flaming-arc lamp, calling particular attention to the new Thompson safety cut-out hangers, used both for arc lamps and large tungsten units and clusters.

The Charles L. Kiewert Company of New York made a display of carbons for use in motion-picture machines.

The Saluform Products Company of Chicago showed a new attachment for electric fans, consisting of an annular ring with an upper compartment for storing a liquid called "saluform." This attachment, which is fastened to the fan guard, has an opening across which are arranged vertical rows of diffusing tubes of a special patented composition. The tops of these tubes are inserted in the saluform reservoir and the liquid fed into them by gravity. The tubes are porous and the liquid evaporates through them, the vapor thus being diffused through the atmosphere by the action of the air blast. Fans of an oscillating type are used. In operation the device is said to cool and purify the air, produring a refreshing element which is described as "forestized air."

The Pyrene Company of Illinois displayed the Pyrene fire extinguisher. A feature of its exhibit was a glass tank containing a quantity of the Pyrene liquid. In this liquid, which is said to be a non-conductor of electricity, a small electric motor partially submerged was in operation. A number of incandescent lamps were burning with their sockets immersed in the liquid.

Several motion-picture machines were exhibited, that of the Nicholas Power Company of New York, known as the "cameragraph," having an arc lamp capable of taking as much as 100 amp and having fourteen adjustments for hand regulation. This machine is adapted for motor drive.

## SOCKET AND RECEPTACLE FOR LARGE-BASE LAMPS.

The brass shell and socket shown in Fig. 1, manufactured by Pass & Seymour, Inc., Solvay, N. Y., has a ⅜-in. cap made for large-base 500-watt incandescent lamps, although the same type of socket is manufactured with a ½-in. cap as well. The cap and shell are fitted with a fine thread and the shade holder is rigidly and permanently attached to the shell. By means of a set screw on the cap the lower shell is kept from backing out of place when once in position. The regulation center-spring contact is made of phosphor bronze, and the fiber lining of the shell is readily removable in case refinishing is desirable at any time. The socket may be obtained with the firm's "Shurlok" attachment. The outlet box and receptacle shown in Fig. 2 is also designed for use with large-base 500-watt lamps and is made complete with the shade holder rigidly attached. The receptacle is located well down into the box, and contact terminals are

Figs. 1 and 2—Socket and Receptacle for Large-Base Lamps.

arranged so that it is an easy matter to loop the conductor up without cutting the wire, regardless of whether single or twin conductors are used.

## FREQUENCY METERS.

By the use of frequency meters irregularities in the operation of engine or waterwheel governors may be readily detected and immediately brought to the attention of the operator so that adjustments can be made. On circuits that supply energy to induction motors driving textile-mill and other machinery requiring constant speed, constant frequency is essential, and the installation of a frequency meter will constantly indicate the speed being maintained. In the central station supplying energy for lighting and motor service the maintenance of normal frequency is equally important.

The frequency meter here illustrated shows the frequency by means of a continuous scale and pointer, whereas meters that operate by means of resonance reeds or simi-

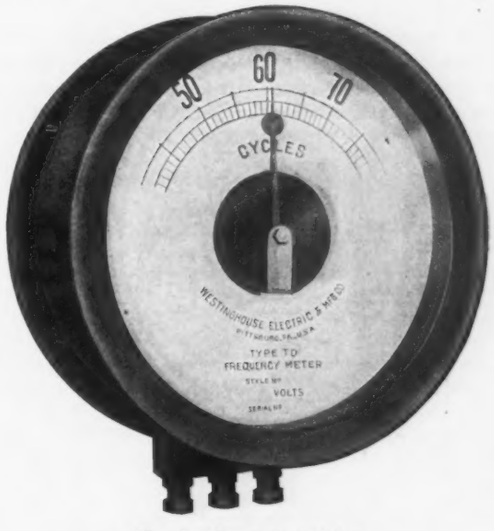



Fig. 1—Frequency Meter.

lar devices have only a definite number of possible indications and intermediate points are entirely lacking.

The meter consists of two induction voltmeter elements *A* and *B* (Fig. 3), acting on a disk *G* and tending to move the disk (and the pointer shaft) in opposite directions. One of the elements is in series with a resistor *H*, and the other in series with a reactor *I*, so that any change in the fre-

quency tends to change the relative strength of the two magnets and cause rotation. The disk is so shaped that as it moves the amount of its metal under the stronger magnet becomes less than that under the weaker magnet, so that with every relation between the two magnet strengths there is some point where the torques produced by the two magnets balance and the pointer comes to rest. Magnet *A* tends

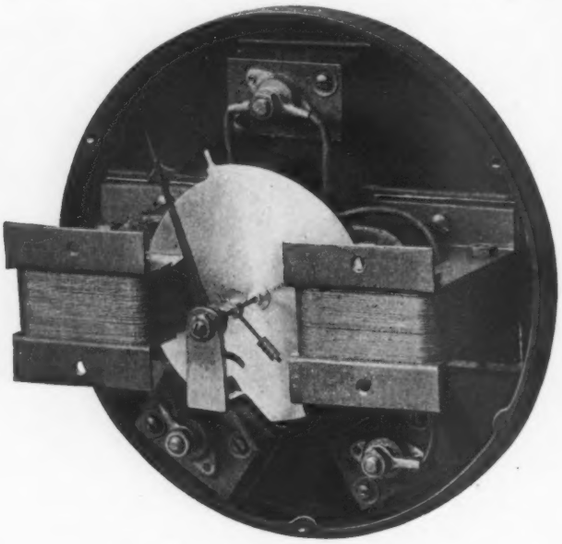


Fig. 2—Details of Meter.

to turn the disk in clockwise direction and magnet *B* in the opposite direction.

The torque of each magnet is proportional to the square of the current in the coil and to the frequency. At normal frequency the torques balance when the disk is in the middle position. If the frequency increases the current in coil *A*, which is in series with the resistor, remains unchanged and its torque increases because of the higher frequency; the current in coil *B*, which is in series with the reactor, diminishes and its torque diminishes correspondingly. The disk, therefore, turns toward the right. For similar reasons, if the frequency decreases, the disk turns toward the left.

If the periphery of the disk were a true circle, any change in frequency which would cause the torques of the two magnets to be unequal wou'd produce continuous rotation in one or the other direction. The disk is, therefore,

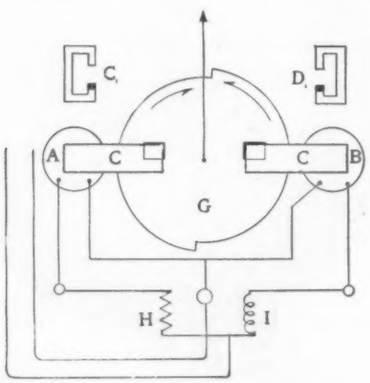



Fig. 3—Diagram of Meter Connections.

made of a special shape. The left-hand edge of the disk, which moves under magnet *A*, is practically the arc of a circle, having its center at the shaft. The right-hand edge, which moves under magnet *B*, is practically the arc of a circle with its center slightly above the shaft. With this arrangement the amount of metal in the air-gap of *A* is always practically the same, while the amount of metal in the air-gap of *B* depends on the position of the disk. When magnet *B* becomes relatively stronger than *A*, owing to low frequency, the disk turns toward the left and the amount of metal in the air-gap of *B*, and consequently the torque of *B*, gradually decrease until the torques of the two magnets balance, whereupon the disk stops. When magnet *B* becomes relatively weaker than *A*, owing to high frequency, the disk turns toward the right, and the amount of metal in the air-gap of *B*, and consequently the torque of *B*, gradually increase until the torques of the two magnets balance, when the disk stops. For every frequency there is a definite point at which the disk comes to rest.

As actually constructed, the edges of the disk are not true circular arcs. The shape is determined experimentally, so that a uniform scale will result.

Any change in voltage applied to the two voltmeter elements changes the current in both of them in the same proportion, so that their relative torques are not changed. The meters are, therefore, unaffected by voltage changes within wide limits.

The moving element consists of the meter disk, the pointer, a counterweight and the shaft. This element is so balanced that the pointer will remain in any position when no current is on the windings. No control spring is used, as all the forces controlling the movement of the pointer are electromagnetic, which results in permanent calibration.

The meters are built in 7-in. and 9-in. round pattern and in vertical edgewise and portable types by the Westinghouse Electric & Manufacturing Company.

## SINGLE-UNIT LIGHTING FIXTURE.

For use in shop lighting a single unit is considered by many to be more suitable than multiple units, especially over benches, lathes, tools, etc., as a more uniform lighting effect is secured. The Delta-Star Electric Company, of Chicago, has developed a single unit consisting of a porcelain enameled steel shade, complete with keyless socket and stranded rubber-covered wires ready for connection to the ceiling wires. The fixtures are so designed as to be con-

Shop-Lighting Unit.

centrating or distributing, depending upon the rating of the lamp used. With a 40-watt lamp the relation of the filament to the reflector is such that the light is concentrated and with a 60-watt lamp the light is distributed. In designing the reflector slots or holes in the steel have been avoided, thus eliminating edges from which the enamel will break off, exposing the steel to atmospheric action, acid, etc.

# Industrial and Financial News

SEASONABLE weather in the greater part of the agricultural districts has given still further promise of excellent harvests, and in consequence of this favorable outlook a high degree of optimism is noticeable in commercial circles. The volume of business in the many branches of the electrical industry shows large gains over that recorded at this time last year. Many of the local jobbers, contractors and manufacturers say, however, that while they have no fault to find with the volume of orders, they are frequently unable to get their prices owing to existence of keen competition and that profits are rather meager on this account. Many look for higher prices in view of the ascending trend of the copper market. During the week W. S. Barstow & Company placed orders for additional equipment for several of the central stations designed by them and the Alabama Interstate Power Company awarded a contract for construction of a dam on the Coosa River, near Birmingham, where it will shortly begin construction of its first development of 60,000 hp. Specifications for the equipment will be issued with a short time. Dividend disbursements on public-utility stocks next month are placed at $1,425,997 and interest payments on public-utility bonds are placed at $5,727,535. The General Electric Company has awarded contracts for structural material for extensions to its plant at Erie, Pa.

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**Personnel and New Acquisitions of the Middle West Utilities Company.**—The latest of the Insull companies—that is, the Middle West Utilities Company of Chicago—was formed so quietly that its organization and scope may not be generally known, although several references to it have appeared in the *Electrical World* (May 4, 1912, *et seq.*) and elsewhere. The company was incorporated under the laws of Delaware in April, 1912, and its principal office is in the Merchants' Loan & Trust Building, Chicago. The new company is capitalized for $10,000,000, divided into $4,000,000 of 6 per cent preferred stock and $6,000,000 of common stock. Its purpose is to finance and reorganize public utilities, mainly in the Middle West. Samuel Insull is president of the company. He is also president of the Commonwealth Edison Company of Chicago, the Public Service Company of Northern Illinois and the Illinois Northern Utilities Company, as well as chairman of the trustees of the Chicago Elevated Railways. A large portion of the cash capital of the company was subscribed by his English friends, the remainder being privately subscribed in Chicago. Public subscriptions to the stock were not solicited, Mr. Insull's friends at home and abroad having sufficient confidence in his administrative ability to subscribe all the necessary funds with eagerness. It is understood that he controls this company personally and his future operations will be conducted through it as a medium. The list of officers is as follows: President, Samuel Insull; vice-presidents, Martin J. Insull, John F. Gilchrist and Frank J. Baker; treasurer, R. W. Waite; secretary, E. J. Doyle. Among the directors are Samuel Insull, Charles A. Munroe, William A. Fox, Martin J. Insull, Frank J. Baker, John H. Gulick, Frank T. Hulswit, Edward J. Doyle, Frederick Sargent, Louis A. Ferguson, John F. Gilchrist and Edward P. Russell. The executive committee consists of Messrs. Samuel Insull, E. P. Russell, Martin J. Insull, Munroe, Baker, Fox and Gulick. It is an interesting fact that nearly every one of the directors has been closely associated with Samuel Insull in the conduct of public-utility enterprises. Mr. Hulswit is president of the United Light & Railways Company of Grand Rapids, Mich.; Mr. Sargent is of Sargent & Lundy, engineers, of Chicago, and Mr. Russell is of the firm of Russell, Brewster & Company, the well-known financial house of Chicago. All the other directors named except Martin J. Insull, a brother of Samuel Insull and until recently general manager of the United Gas & Electric Company of New Albany, Ind., are connected directly with the Commonwealth, Public Service or Illinois Northern companies. The Middle West company has already made extensive acquisitions of properties in Illinois, Indiana and Kentucky. It purchased last week the Freeport Railway & Light Company of Freeport, Ill. This company, which is itself a consolidation of older companies, does both the electric service and street railway business of Freeport, a city of 18,000 inhabitants in the northwestern part of the State. A. J. Goddard is president and manager. The company owns two steam stations and a hydroelectric development. It has the city lighting contract. Two dams on the Pecatonica River are included in the transfer. The property of the company will be put in first-class condition by the new owners. Negotiations have also been completed by which the Middle West Utilities Company has purchased the Tulsa Corporation of Tulsa, Okla. This company supplies the electrical energy sold in the city of Tulsa, giving twenty-four-hour electric service and doing the city street lighting under contract. Tulsa had 18,182 inhabitants in 1910, and its electric service company is said to be the third largest in the State. Paul M. Gallaway is secretary and manager of the Tulsa company. The Middle West Company has announced a first quarterly dividend of 1½ per cent on the preferred stock for the period between May 15 and Aug. 15, 1912. The dividend will be paid on Sept. 1 to shareholders of record at 5:30 p.m. on Aug. 15.

**Barstow Company Awards Station Equipment Contracts.**—W. S. Barstow & Company, Inc., 50 Pine Street, New York, consulting engineers, who also manage and finance public utilities, and who recently organized the General Gas & Electric Company under the laws of Maine, as stated in these columns July 6, to take over a number of gas, electric-lighting and traction companies in Vermont and Ohio, have placed orders for additional equipment to be installed in the 1500-kw power station of the Northwestern Ohio Railway & Power Company at Port Clinton, Ohio, on Lake Erie. This company, as noted previously, is controlled and managed by the General Gas & Electric Company through the Barstow organization and has purchased the Toledo, Port Clinton & Lakeside Railroad. The Port Clinton power house has been enlarged by the Barstow engineers and the new apparatus to be installed in it for which orders have been placed includes a 1700-kva General Electric turbine unit, a Le Blanc condenser, two 300-hp Stirling boilers and Jones auto-feed stokers. The same engineers are now completing an enlargement of the electric plant of the Excelsior Springs (Mo.) Water, Gas & Electric Company. In addition to the present equipment the enlarged station building will contain a 325-kw Allis-Chalmers-Bullock engine-driven generating set, three 150-hp Kewanee boilers and Deane feed pumps.

**New Directors for Telluride Power Company.**—At a meeting of the board of directors of the Telluride Power Company for reorganization this week several of the directors and officers of the company were replaced by representatives of the syndicate which recently purchased the property, as was noted in these columns Aug. 3. The purchase was made in the interest of the Electric Bond & Share Company. Those who resigned from the board were: L. L. Nunn, general manager; A. T. Perry, treasurer; O. M. Stafford, vice-president; F. J. Wade, Ralph T. King, D. Leuty and Andrew Squire. The new directors are J. R. Nutt, Bascom Little, C. L. Bradley, W. S. Hayden and W. H. Baldwin, of Cleveland, and J. D. Mortimer, of Milwaukee, vice-president of the North American Company. Mr. Nutt was elected president; P. B. Sawyer, of Cleveland, vice-president, and George Lomnitz, of Cleveland, treasurer.

**Illinois Traction System Acquiring Lighting Properties.**—The Illinois Traction System, with executive offices in Peoria, has purchased the Chenoa Electric Light & Power Plant, of Chenoa, Ill., for a consideration said to be $35,000. The properties at El Paso and Gridley, Ill., have also been purchased by the Illinois Traction System recently. All three of these local systems will be operated by means of a transmission line from the Bloomington plant of the traction system.

**Good Prospects for Insulated-Wire Trade.**—"We are very optimistic," said the head of one of the prominent insulated-wire companies this week to a representative of the *Electrical World*, "over the outlook in our line of business for the rest of the year. There are a number of unusually favorable conditions in the trade at present upon which we base our belief. Demand for insulated wire is very good just now, and as many of the large users have been buying on a hand-to-mouth policy during the past year or so their stocks are low and a considerable increase in the volume of inquiries and orders is expected before long. While the volume of business is large the existence of strong competition is curtailing profits to an appreciable degree. We find that competitors frequently cut prices from 5 to 7 per cent on the larger orders. In spite of this, our sales each month this year have shown an increase over the corresponding month of 1911, and sales last month went about 18 per cent ahead of those in July a year ago. It is very likely that prices for rubber-covered wire will be higher during the remainder of the year. This is on account of the advancing tendency of both the rubber and the copper markets, a trend which in our opinion is based upon actual demand for these products. These advances in price are undoubtedly a natural outcome of the new requirements of the National Board of Underwriters that went into effect on Jan. 1. It is a little too early for the reputable manufacturers of rubber-covered wire to feel the beneficial effects that will be derived from the new specifications, as in many instances dealers and contractors have been taking advantage of the period between Jan. 1 and July 1 in which they were at liberty under the new rules to dispose of wire on hand or under contract that does not meet the rigid tests of the board. The use of inferior coverings, selling naturally at low figures, has caused a serious inroad upon the business of the reputable manufacturers in the past. When users of insulated wire begin to replenish their stocks, as they undoubtedly will before long, the contracts will be based entirely upon the new specifications, and the business of the high-grade companies will expand still further."

**A. B. Leach Elected President of Columbia Gas & Electric (Ohio).**—Reorganization of the boards of directors of the Columbia Gas & Electric Company, of Cincinnati, and its subsidiary, the Union Gas & Electric Company, of the same city, which was forecast in these columns Aug. 10, was effected Aug. 14. A. B. Leach, P. G. Gossler and George P. Tobey, of A. B. Leach & Company, the firm that headed the syndicate which recently purchased these properties, as noted in the *Electrical World*, July 20; Henry Seligman, Frederick Strauss and William S. Cox, of J. & W. Seligman & Company, another member of the purchasing syndicate, and W. Y. Cartwright, general manager of the Hope Natural Gas Company, of Clarksburg, W. Va., were elected directors of the Columbia company to succeed A. S. White, R. W. White, John Omwake, C. H. Davis, F. R. Williams, N. S. Keith and Norman G. Kenan, of Cincinnati, and Caleb E. Gowan, of Cleveland. The other directors were retained. The directors organized with P. G. Gossler as chairman of the board; A. B. Leach, president; James C. Ernst, F. B. Enslow and W. Y. Cartwright, vice-presidents, and W. T. Hunter, secretary and treasurer. Mr. Cartwright will be the expert on natural-gas matters and will give special attention to that part of the business. The new board of the Union Gas & Electric Company consists of P. G. Gossler, William S. Cox, W. Y. Cartwright, J. T. Carew, F. B. Enslow, James C. Ernst, J. W. Gill, August Herrman, W. T. Hunter, J. M. Hutton, A. B. Leach, M. E. Moch, Theodore Clauss, Louis J. Hauck and George W. Crawford. A. B. Leach was elected president, J. C. Ernst and W. Y. Cartwright vice-presidents, Theodore Clauss secretary and W. T. Hunter treasurer of the Union company.

**Electric Bond & Share in New Texas Company.**—Following its acquisition of several of the public-utility companies in and near Waco, Tex., which it has grouped under the name of the Texas Power & Light Company, as noted in these columns May 18, the Electric Bond & Share Company has now obtained an interest in the electric-lighting company at Wichita Falls, in the northern part of the State. The Wichita Falls Water & Light Company, which formerly operated the public utilities in Wichita Falls, has been dissolved, and the water and electric branches of the business have been segregated and transferred to two separate companies that have just been formed. One of these, the Wichita Falls Electric Company, which has been incorporated with a capitalization of $700,000, has been formed in the interest of the Electric Bond & Share Company. The other company, the Wichita Falls Water Company, has a capital stock of $400,000 and will carry on the water business of the former company.

**A New Firm of Specialty Makers.**—Edward Schwartz, until recently general superintendent of the Pelouze Manufacturing Company of Chicago, has resigned from that company and has obtained a half interest in the recently organized firm of William E. Slaughter & Company, which will soon be incorporated under that name. Mr. Schwartz is an experienced designer and inventor of electrical specialties, and the new concern, which will have its headquarters at 1712 South Michigan Avenue, Chicago, will engage in the manufacture of various electrical appliances. Mr. Schwartz is a native of Austria and early in life became known as an expert tool maker. For several years he was connected with the Western Electric Company and other telephone manufacturing companies. A number of patents for his inventions have been granted to him.

**Tennessee Railway, Light & Power's Initial Dividend.**—An initial quarterly dividend of 1½ per cent on its $10,250,000 preferred stock has been declared by the Tennessee Railway, Light & Power Company, which was formed this spring to construct and operate hydroelectric plants in Tennessee, as was mentioned in these columns April 13, 1912. The company controls the Tennessee Power Company, the Nashville Railway & Light Company and the Chattanooga Railway & Light Company. Details of its hydroelectric developments on the Ocoee River, in Tennessee, were given in the *Electrical World* July 27, page 201. The dividend is payable Sept. 3, 1912, on stock of record Aug. 20.

**Electrical Apparatus for Panama Canal Locks.**—Contracts have been awarded to the General Electric Company for seventy-two power transformers, thirty-nine lighting transformers and thirty-six banks of oil switches to be installed in the transformer rooms within the lock walls of the Panama Canal. Miscellaneous electrical equipment, including ground plate, copper bars, tape, cable, bells and other accessories, will be purchased from the Standard Underground Cable Company of Pittsburgh, the G. & W. Electric Specialty Company of Chicago, the Westinghouse Electric & Manufacturing Company and the General Electric Company.

**New Public Utility Management Company Formed.**—The Civic Service Corporation, with offices at 132 South Fifteenth Street, Philadelphia, has been incorporated to take over and continue the public-utility and general engineering business conducted individually in the past by T. Wilson Battin and A. L. Osgood. The latter is general manager of the new concern, G. H. Stetson is president, T. W. Battin is vice-president and secretary, and J. L. Patton is treasurer. Management of gas, water, electric lighting, heating and traction systems, examinations of public-utility properties and financing of extensions and improvements will be the functions of the new concern.

**McCrum-Howell Reorganization Plan.**—Announcement of a plan for reorganization of the McCrum-Howell Company, the vacuum-cleaner, radiator, boiler and enameled-ware concern for which receivers were appointed early this year, as noted in these columns March 23, is expected shortly. A stockholder of the company said this week that sufficient assets have been collected to form a basis for placing the company in a satisfactory condition. Those who were responsible for placing the company in its present condition will have no voice in the new management, he added.

**Public Utility Merger in Northern Indiana.**—According to newspaper reports, the Northern Indiana Utilities Company has been formed by the Insull interests to take over various electric-service properties in cities and villages in northern Indiana. It is reported that central-station plants have been acquired in Monticello, Wolcott, Earl Park, Fowler and Kentland, Ind. The capitalization of the new company is said to be $1,075,000. If the report is correct, it is probable that the new company is a subsidiary organization of the Middle West Utilities Company.

**Long Island (N. Y.) Public Utility Changes.**—The Public Service Commission of the Second New York District has authorized the Suffolk Light, Heat & Power Company to purchase from the Riverhead Electric Light Company that part of its franchise and system which it now owns and operates in the town of Southampton, Suffolk County, and to exercise a franchise granted to the Riverhead company. The Suffolk company is authorized to execute a mortgage upon its entire property to secure the payment of its refunding and extension 5 per cent twenty-five-year gold bonds of the par value of $300,000. The company is authorized to issue at this time bonds to the par value of $47,000, to be sold at not less than 85. Of the proceeds of these bonds, $23,000 is to be used to pay for the property of the Riverhead company in Southampton and $17,950 for extensions and improvements to its plant and distributing system. In the purchase of the Riverhead property the commission finds the estimated reproduction cost of the property to be $15,000 and that the company is reasonably entitled to capitalization to the amount of $2,000 on account of the business now secured in that locality. The remaining $5,000 must be wiped out of the capital account in ten years by the payment of $500 annually out of earnings.

**Brooklyn Edison to Acquire Amsterdam Electric Light, Heat & Power Company.**—The Edison Electric Illuminating Company of Brooklyn has applied to the Public Service Commission for the First New York District for authority to purchase 122 shares of the common stock of the Amsterdam Electric Light, Heat & Power Company, of a par value of $12,200. The capital stock of the Amsterdam company is $500,000, and $487,800 of this is already owned by the Brooklyn Edison company. The commission will hold a hearing on the matter on Sept. 16.

**Ohio Telephone Companies Merged.**—Negotiations have been closed by which the Fremont Home Telephone Company of Fremont, Ohio, will take over the plant of the Central Union Telephone Company at that place. While the two local exchanges will be merged, the Bell company will retain the long-distance business. The Home Telephone Company will ask for permission to increase its capital stock from $150,000 to $250,000 and will submit a new schedule of rates for the approval of the Ohio Public Service Commission.

**Vote to Consolidate Washington (D. C.) Utilities.**—Stockholders of the Washington (D. C.) Railway & Electric Company this week approved the plan for consolidating the Anacostia & Potomac River Railroad Company, the Brightwood Railway Company, and the Washington, Woodside & Forest Glen Railway & Power Company with the Washington Railway & Electric Company, to which reference was made in these columns June 20. The change is in the legal form of holding the properties.

**Kansas City Railway & Light Protective Committee.**—A protective committee consisting of John B. Dennis, of Blair & Company; S. Y. Fuller, of Kissell, Kinnicutt & Company; J. J. Storrow, of Lee, Higginson & Company, and Paul M. Warburg, of Kuhn, Loeb & Company, has been formed for the holders of the two series of 6 per cent collateral-trust notes of the Kansas City Railway & Light Company, due Sept. 1, 1912.

**Cleveland Telephone Increase Approved.**—The Ohio Public Service Commission has approved an application of the Cleveland Telephone Company to issue $900,000 additional capital stock, to be sold at not less than par. The authorized capital stock of the company is $4,000,000, and this increase will bring the outstanding amount up to that figure.

**Receiver for Pennsylvania Telephone Company.**—S. R. Caldwell, of West Chester, Pa., has been appointed temporary receiver for the United Telephone & Telegraph Company, of Philadelphia. This company is a subsidiary of the American Union Telephone Company, of Harrisburg.

**Pacific Office of Byllesby Company Removed to Tacoma.**—The Pacific Coast headquarters of H. M. Byllesby & Company of Chicago has been removed from Portland, Ore., to Tacoma, Wash.

**General Electric Improvements.**—Contracts for 300 tons of structural material to be used for extension to its plant at Erie, Pa., have been placed by the General Electric Company.

## REPORTS OF EARNINGS.

### PACIFIC POWER & LIGHT COMPANY, PORTLAND, ORE.

The earnings statements of the Pacific Power & Light Company, of Portland, Ore., for the months of July, 1912 and 1911, and for the twelve months ended July 31, 1912 and 1911, compare as follows:

| July. | 1912. | 1911. |
|---|---|---|
| Gross earnings | $103,201 | $93,336 |
| Operating expenses and taxes | 50,520 | 58,663 |
| Net earnings | $52,681 | $34,673 |
| Total interest | 23,943 | 31,626 |
| Net income after charges | $28,738 | $3,047 |

| Twelve months ended July 31. | 1912. | 1911 |
|---|---|---|
| Gross earnings | $1,218,018 | $1,164,906 |
| Operating expenses and taxes | 625,905 | 616,901 |
| Net earnings | $592,113 | $548,005 |
| Total interest | 325,440 | 279,637 |
| Net income after charges | $266,673 | $268,368 |
| Preferred dividend | $118,125 | 65,625 |
| Second preferred dividend | 30,000 | |
| | 148,125 | |
| Balance | $118,548 | $202,743 |

### DAYTON (OHIO) POWER & LIGHT COMPANY.

The income statement of the Dayton (Ohio) Power & Light Company for the months of July, 1912 and 1911, and for the seven months ended July 31, 1912 and 1911, compare as follows:

| July: | | 1912. | | 1911. |
|---|---|---|---|---|
| Gross earnings | | $49,004 | | $44,187 |
| Operating expenses (including taxes) | | 25,718 | | 26,975 |
| Net earnings | | $23,286 | | $17,212 |
| Interest receivable | | 1,745 | | .... |
| Total income | | $25,031 | | $17,212 |
| Interest on bonds | $14,993 | | $14,362 | |
| Uncollectible accounts | 249 | | 220 | |
| Total deductions | | 15,242 | | 14,582 |
| Net income | | $9,789 | | $2,630 |

| Seven months ended July 31: | | 1912. | | 1911. |
|---|---|---|---|---|
| Gross earnings | | $384,918 | | $348,789 |
| Operating expenses (including taxes) | | 198,885 | | 202,945 |
| Net earnings | | $186,033 | | $145,844 |
| Interest receivable | | 16,754 | | 40 |
| Total income | | $202,787 | | $145,884 |
| Interest on bonds | $115,918 | | | |
| Uncollectible accounts | 1,971 | | | |
| Total deductions | | 117,889 | | 105,587 |
| Net income | | $84,898 | | $40,297 |

### AMERICAN GAS & ELECTRIC COMPANY.

The income accounts of the subsidiaries of the American Gas & Electric Company named below for the months of July, 1912 and 1911, and for the twelve months ended July 31, 1912 and 1911, compare as follows:

ATLANTIC CITY (N. J.) ELECTRIC COMPANY.

| | Gross. | Net. | Surplus After Charges. |
|---|---|---|---|
| July, 1912 | $49,509 | $35,680 | $27,097 |
| July, 1911 | 44,159 | 26,979 | 19,175 |
| Twelve Months: | | | |
| July, 1912 | 441,018 | 262,643 | 160,604 |
| July, 1911 | 399,728 | 211,700 | 128,546 |

CANTON (OHIO) ELECTRIC COMPANY.

| | | | |
|---|---|---|---|
| July, 1912 | $25,596 | $12,288 | $7,569 |
| July, 1911 | 20,201 | 9,254 | 4,478 |
| Twelve Months: | | | |
| July, 1912 | 334,378 | 165,026 | 107,955 |
| July, 1911 | 293,530 | 156,965 | 101,284 |

MUNCIE (IND.) ELECTRIC COMPANY.

| | | | |
|---|---|---|---|
| July, 1912 | $27,204 | $8,719 | $2,133 |
| July, 1911 | 19,588 | 7,647 | 1,787 |
| Twelve Months: | | | |
| July, 1912 | 357,692 | 151,425 | 76,475 |
| July, 1911 | 294,990 | 111,345 | 52,362 |

ROCKFORD (ILL.) ELECTRIC COMPANY.

| | | | |
|---|---|---|---|
| July, 1912 | $27,601 | $9,756 | $1,943 |
| July, 1911 | 25,322 | 11,227 | 3,570 |
| Twelve Months: | | | |
| July, 1912 | 404,247 | 191,877 | 98,305 |
| July, 1911 | 374,597 | 153,517 | 69,843 |

WHEELING (W. VA.) ELECTRIC COMPANY.

| | | | |
|---|---|---|---|
| July, 1912 | $18,769 | $8,363 | $4,324 |
| July, 1911 | 15,760 | 6,886 | 3,597 |
| Twelve Months: | | | |
| July, 1912 | 245,705 | 123,021 | 76,805 |
| July, 1911 | 186,671 | 99,058 | 82,354 |

**PRICES IN NEW YORK METAL MARKET.**

| | Aug. 13 | | Aug. 20 | |
|---|---|---|---|---|
| Copper: | | | | |
| Standard: | Bid. | Asked. | Bid. | Asked. |
| Spot | 17.25 | 17.50 | 17.25 | 17.50 |
| August | 17.25 | 17.50 | 17.25 | 17.50 |
| September | 17.25 | 17.50 | 17.37½ | 17.50 |
| October | 17.25 | 17.50 | 17.30 | 17.50 |
| November | 17.20 | 17.50 | ..... | ..... |
| London quotation: | £ s d | | £ s d | |
| Standard copper, spot | 78 12 6 | | 78 17 6 | |
| Standard copper, futures | 78 12 6 | | 78 17 6 | |
| Prime Lake | 17.60 to 17.70 | | 17.60 to 17.70 | |
| Electrolytic | 17.60 to 17.70 | | 17.60 to 17.65 | |
| Casting | 17.35 to 17.45 | | 17.35 to 17.45 | |
| Copper wire, base | 19.00 | | 19.00 | |
| Lead | 4.50 | | 4.50 | |
| Sheet zinc, f.o.b. smelter | 8.75 | | 8.75 | |
| Spelter, spot | 7.00 | | ..... | |
| Nickel | 40.00 to 41.00 | | 40.00 to 41.00 | |
| Aluminum: | | | | |
| No. 1 pure ingot | 21½ to 22½ | | 21½ to 22½ | |
| Rods and wire, base | 32 | | 32 | |
| Sheets, base | 33½ | | 33½ | |
| OLD METALS. | | | | |
| Heavy copper and wire | 15.75 | | 15.50 | |
| Brass, heavy | 10.00 | | 10.00 | |
| Brass, light | 8.00 | | 8.00 | |
| Lead, heavy | 4.15 | | ..... | |
| Zinc, scrap | 5.75 | | 5.75 | |

**COPPER EXPORTS IN AUGUST.**

| | | |
|---|---|---|
| Total tons, including | Aug. 13, 7,788 | Aug. 20, 14,738 |

**STOCK MARKET PRICES.**

| | Aug. 14. | Aug. 21. |
|---|---|---|
| Allis-Chalmers | 1½* | ¼* |
| Allis-Chalmers, pf | 5⅜* | 2½* |
| Amalgamated Copper | 85⅜ | 87½ |
| Amer. Tel. & Tel. | 146⅛ | 146 |
| Boston Edison | 291* | 291* |
| Commonwealth Edison | 138½ | 139* |
| Electric Storage Battery | 57¼ | 57¼ |
| General Electric | 183¼ | 183 |
| Mackay Companies | 89 | 87* |
| Mackay Companies, pf | 69¼* | 69* |
| Philadelphia Electric | 23½ | 23⅜ |
| Western Union | 83½ | 83 |
| Westinghouse | 88 | 88 |
| Westinghouse, pf | 126 | 125 |

*Last price quoted.

# Personal

**Mr. D. O. Frailey,** of Everett, Wash., has been appointed city engineer of Monroe, Wash.

**Mr. S. W. Coleman,** formerly general manager for the Coast Counties Light & Power Company at Santa Cruz, Cal., has been transferred to the San Francisco office of the company.

**Mr. Edward J. Doyle,** private secretary of Mr. Samuel Insull, has been made secretary of the recently organized Middle West Utilities Company of Chicago, a ten-million-dollar corporation.

**Mr. R. L. Cardiff,** formerly chief electrician of the Coast Counties Light & Power Company at Santa Cruz, Cal., is now in charge of the plant, having succeeded Mr. C. W. Coleman as general manager.

**Mr. C. H. Howell** on Aug. 17 assumed his new duties as superintendent of the Coshocton Light & Heating Company, Coshocton, Ohio, succeeding Mr. S. E. Holderman, who has just left on a business trip through the West.

**Mr. F. B. Strong,** president and general manager of the Technical Publishing Company, San Francisco, which publishes the *Journal of Electricity, Power and Gas,* is making a tour of the eastern section of the United States.

**Mr. Martin J. Insull,** formerly general manager of the United Gas & Electric Company of New Albany, Ind., now vice-president of the Middle West Utilities Company, has moved to Chicago, where the principal office of the latter company is located.

**Mr. George M. Miller,** for several years assistant to Mr. William Holloway, superintendent of the distributing department of the Kentucky Electric Company, Louisville, Ky., has succeeded to Mr. Holloway's position, owing to the latter's ill health, which has made it necessary for him to resign.

**Mr. Egbert Douglas,** until recently sales manager for The Milwaukee Electric Railway & Light Company, is now connected with the new-business department of H. M. Byllesby & Company. Before going to Milwaukee Mr. Douglas was contract agent for the Springfield (Ohio) Light, Heat & Power Company.

**Mr. A. Larney** has been appointed manager of the new-business department of the Minneapolis General Electric Company. Mr. Larney had been new-business manager of the Consumers' Power Company of St. Paul for some time. He succeeds **Mr. H. J. Gille** at Minneapolis.

**Mr. William J. Norton,** rate expert of the Commonwealth Edison Company, Chicago, will be the editor of the monthly *Rate Research Bulletin,* which will be issued in printed form by the rate research committee of the National Electric Light Association, Mr. Norton being secretary of the committee.

**Dr. A. E. Kennelly** left Boston on Aug. 23 to attend the meeting of the British Association for the Advancement of Science, at Dundee, Scotland, which is to be held in the early part of September. Dr. Kennelly will present a paper recording the result of recent researches in telephone-receiver impedances.

**Mr. R. G. Black,** formerly superintendent and chief electrician of the Toronto Electric Light Company, Toronto, Ont., who, broken down in health, sailed for Europe on Nov. 15, to consult specialists, has returned to Toronto again somewhat improved in appearance, but not altogether so robust as he was prior to his illness.

**Mr. L. W. Hench,** who for the past three years has been power engineer of the Youngstown Consolidated Gas & Electric Company, has resigned and will become the Youngstown representative of the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, Pa. Mr. Hench will continue, as in the past, to be the local representative for the Winton and Pierce-Arrow automobile concerns.

**Mr. Sidney L. Cole,** who has served in various capacities the lighting companies at Waukegan, Ill.; Little Rock, Ark., and Fort Madison, Ia., since his graduation from the Massachusetts Institute of Technology in 1905, has been appointed manager of the Municipal Electric Light & Gas Plant at Wakefield, Mass., to succeed **Mr. Albert B. Morton,** who resigned to become superintendent of the Rome (N. Y.) Gas, Electric Light & Power Company.

# Obituary

**Mr. Harris Boardman,** superintendent of the Edison Electric Illuminating Company, Lancaster, Pa., died at Atlantic City on July 25. Mr. Boardman is survived by a widow and two small children.

**Mr. Warren H. Girvin,** formerly manager of the Syracuse (N. Y.) Lighting Company, died at his home in Marshall Street, Syracuse, N. Y., on Aug. 16. Mr. Girvin was born in Oneida, N. Y., in 1865 and went to Syracuse about forty years ago. Starting as a telegraph operator, he later became interested in the Bell Telephone Company and was made manager of the local office, which position he held until 1890, after which he assumed the management of the Syracuse Lighting Company. In 1900 he returned to the telephone business, but ill-health compelled him to retire in 1905. A widow, son and daughter survive Mr. Girvin.

**Mr. Thomas H. Brady,** proprietor of the Brady Electric Manufacturing Company, of New Britain, Conn., died at his summer home, Westbrook, Conn., Sunday morning, Aug. 18, aged sixty-nine years and six months. Mr. Brady was one of the earliest pioneers in the manufacture of outside electrical construction material, his first contribution being the well-known Brady mast-arm, patented in 1897. Since then his patents have been numerous and his goods have been extensively known throughout the country. Mr. Brady was a familiar figure at conventions of the National Electric Light Association until within the past few years, and his acquaintance in the electric field, especially among those who may be called the old-timers, was very extensive. His social spirit and fund of interesting stories of the early days of the electric business made him welcome at any gathering. Mr. Brady leaves a wife and ten children, four girls and six boys, with a well-established incorporated business.

# Construction

COLLINSVILLE, ALA.—Irby Hall is contemplating rebuilding the electric-light plant, recently destroyed by fire.

MONTGOMERY, ALA.—A bill has been passed by the United States Senate authorizing the construction of a dam across the Coosa River for water-power purposes.

MONTGOMERY, ALA.—The Alabama Interstate Pwr. Co., 100 Broadway, New York, N. Y., has awarded a contract for a 1500-ft. dam in connection with its first hydroelectric development on the Coosa River, 42 miles from Birmingham, to McArthur Brothers, 11 Pine Street, New York. Specifications for the power-station equipment will be sent out in about four weeks. The initial installation will develop about 60,000 hp.

LITTLE ROCK, ARK.—It is reported that St. Louis capitalists are interested in the construction of an electric railway to connect Little Rock, Ark., and Memphis, Tenn. Sufficient funds to insure the success of the project have been arranged for, and a company capitalized at $10,000,000 is to be organized to carry on the work. W. H. Langford, of Pine Bluff, Ark., is interested in the enterprise.

ALHAMBRA, CAL.—The City Trustees have voted to install a street-lighting system to form a part of the proposed "Lighted Way" to connect Los Angeles with its suburbs. Concrete posts will be used.

ATWATER, CAL.—Plans have been completed by the San Joaquin Lt. & Pwr. Co., Fresno, Cal., for extending its transmission lines to Atwater and Livingston.

BAIRDSTOWN, CAL.—The town of Bairdstown has formed an assessment district and will install an ornamental street-lighting system.

CORONA, CAL.—The Southern Sierras Pwr. Co., San Francisco, has applied to the State Railroad Commission for permission to transfer to F. A. Worthey its franchise to supply electricity in Corona.

DINUBA, CAL.—The San Joaquin Lt. & Pwr. Co., Fresno, Cal., contemplates the erection of a new substation north of Dinuba, about 1 mile east of its present station. It also plans to rebuild its transmission system in the city, changing from a 4000-volt to a 10,000-volt service.

KELSEYVILLE, CAL.—Press reports state that James Gunn, Jr., of this city, has applied to the State Railroad Commission for permission to supply electrical energy in the towns of Kelseyville, Lakeport, Upper Lake and the surrounding territory in Lake County.

LOS ANGELES, CAL.—Anson W. Delano, Los Angeles, has applied for several franchises to construct and operate an aerial electric railway.

LOS ANGELES, CAL.—The Board of Supervisors has awarded the Eagle Rock Wtr. Co. the contract for lighting the Annandale lighting district for a period of five years.

LOS ANGELES, CAL.—Plans are being prepared by F. C. Finkle, consulting engineer, for the erection of two power plants in the Lytle Creek district for the Fontana Development Co.

LOS ANGELES, CAL.—It is reported that the municipality will compete with private light and power corporations for serving other cities, the Public Service Commission having decided to notify Tropico that Los Angeles will submit a bid to the trustees for supplying electrical energy to that place. It is understood that the light and power business of Long Beach, Santa Monica, Venice, Glendale and Redondo Beach is also to be solicited.

MERCED, CAL.—Plans have been approved by the San Joaquin Lt. & Pwr. Co. for extending its transmission lines to the Atwater and Livingston districts, a distance of about 20 miles. It is expected that work will soon begin on the erection of the lines.

OROVILLE, CAL.—The Oro El. Corpn. is doing preliminary work preparatory to beginning active work on its large power project in Humbug Valley, to cost about $10,000,000. Albert Reed is in charge of the work.

RANDSBURG, CAL.—The Blackhawk Mining Co. is planning to install an electric plant to operate its works. D. A. Blue is manager.

SACRAMENTO, CAL.—Preparations are being made to install interlocking signals on the local street railway systems.

SACRAMENTO, CAL.—The city commission is contemplating submitting to the people a proposition to establish a municipal electric-light plant.

SACRAMENTO, CAL.—The Pacific Gas & El. Co. is investigating the feasibility of building an electric railway across the American River into North Sacramento.

SACRAMENTO, CAL.—Plans are being prepared for improvements to the fire-alarm system and the police signal service. Several miles of wire will be placed underground.

SACRAMENTO, CAL.—The Great Western Pwr. Co. is planning to erect a high-tension transmission line along the Central California Trac. Co.'s system as far as the Consume River. Electricity will be used to operate pumps for irrigating purposes.

SAN BERNARDINO, CAL.—The Pacific El. Ry. Co. has been granted permission to cross all highways between San Bernardino and Riverside.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Pwr. Co. has applied for permission to enter the towns of Morgan and Gilroy.

TROPICO, CAL.—The installation of a municipal lighting system and ornamental street lamps is under consideration.

VENICE, CAL.—The Sunset Tel. Co. is planning to erect a new telephone exchange at Main and Hill Streets, Venice.

TELLURIDE, COL.—It is understood that the Telluride Pwr. Co., the control of which recently passed into the hands of James Campbell, of St. Louis, Mo., and J. R. Nutt, of Cleveland, Ohio, will expend about $1,750,000 in completing the Bear Lake Reservoir in Utah and Idaho, constructing a reservoir on Bear River at Soda Springs, Idaho, and erecting a new generating plant at Oneida Narrows, Idaho. The company operates hydroelectric generating stations in Colorado, Utah and Idaho.

COLLINSVILLE, CONN.—The Collins Co., Collinsville, is preparing to build a new power plant on the Farmington River about 1 mile below its factory. The plans call for the construction of a dam 408 ft. long and 27 ft. high and a brick power house, 52 ft. x 42 ft. The equipment will consist of six waterwheels in two sets of three each, with two shafts on each wheel. Each shaft will be connected with an electric generator. About 1000 hp will be developed.

HARTFORD, CONN.—Press reports state that the United States Rubber Co. is planning to erect a power house in this city, prior to commencing construction work on its new factory. The plant, which will have a capacity of 3000 hp, will contain the latest type of equipment.

WASHINGTON, D. C.—An American official in a South American country states that the government officials of that country are contemplating sending an official commission to the United States to investigate railway electrification, provided that the coming budget provides adequate funds. For further information address No. 9354, Bureau of Manufactures, Department of Commerce and Labor, Washington, D. C.

WASHINGTON, D. C.—An American consul in a Latin-American country reports that a telephone company in his district anticipates extending its lines a distance of about 90 miles, as soon as authorization can be obtained from the federal government. A single copper circuit of No. 8 or No. 10 wire is to be installed. Copy of the report, containing further details and the names of the persons to be addressed regarding the necessary supplies, can be obtained from the Bureau of Manufactures, Washington, D. C. Reference should be made to File No. 9328.

GAINESVILLE, FLA.—The construction of an electric and gas plant is contemplated by the city, and bonds for that purpose to the amount of $35,000 have been voted.

WAUCHULA, FLA.—The City Council has granted the Wauchula Mfg. & Timber Co. a franchise to supply electricity here.

ATLANTA, GA.—Work has been commenced by the Georgia Ry. & Pwr. Co. on a substation in this city, the estimated cost of which is $100,000. The contract for the structure has been let to the Mackle-Crawford Co by the Northern Constr. Co., which has charge of constructing the company's generating plant at Tallulah Falls.

CORDELE, GA.—The bill providing for municipal ownership of an electric-light plant by the city of Cordele and authority to issue $50,000 in bonds for erection of the plant has been passed by the State Legislature.

SARDIS, GA.—Plans are being considered for the installation of an electric-light plant in connection with the water-works system. J. A. Davis is manager of the water-works.

VIDALIA, GA.—The proposition to issue $15,000 in bonds for improvements to the light and water plants will be submitted to a vote on Aug. 29. The J. B. McCrary Company has been engaged to prepare plans for same.

ST. MARIE'S, IDAHO.—The St. Marie's Lt. & Pwr. Co., Ltd., is developing a water-power, by pipe line and turbine wheel, which will increase the output of its plant by from 750 hp to 1000 hp. P. T. Sweeney is president of the company.

ABINGDON, ILL.—The City Council has decided to repeal the ordinance calling an election to vote upon a proposition to construct a municipal electric-light plant and to award a five-year contract for street lighting to the Abingdon Lt. & Pwr. Co.

ALTON, ILL.—It is reported that an ornamental lighting system is to be installed on West Second Street, between Pissa and State Streets, by the business men of Alton. A. T. Vivens is interested in the proposition.

BEECHER, ILL.—The proposition to install an electric-light system in Beecher has been approved by the voters.

BRIDGEPORT, ILL.—The plant and holdings of the Bridgeport Lt. & Pwr. Co. have been sold to Marshall E. Sampsell, Chicago, representing the Central Illinois Public Service Co.

CAIRO, ILL.—Work has been commenced on a large addition to the power plant owned by the Cairo El. & Tract. Co., on upper Sycamore Street. The addition with the new machinery which is to be installed will represent an expenditure of about $150,000, and upon completion the company proposes to supply both Mound City and Mounds with light and power service.

CARLINVILLE, ILL.—Bids will be received by the building committee of the Board of Supervisors of Macoupin County until Aug. 29 for the installation of a lighting plant at the Macoupin County Almshouse.

CHARLESTON, ILL.—The plant and holdings of the Charleston Illg. Co. have been taken over by the Central Illinois Public Service Co.

CHENOA, ILL.—The property of the Chenoa Lt. & Pwr. Co. has been purchased by M. G. Linn and H. E. Chubbuck for $35,000. The purchasers are associated with the Illinois Traction System.

JERSEYVILLE, ILL.—A tentative agreement is said to have been made between the City Council and the Jerseyville Illg. Co. whereby the company will furnish 40-cp lamps for street lighting at $20 each per year and furnish electricity for pumping the city water, if the city wishes to, at 4 cents per kw-hr. The streets are now lighted with lamps of 32 cp.

LAWRENCEVILLE, ILL.—The property of the Lawrenceville Lt. & Wtr. Co. has been purchased by Marshall E. Sampsell, Chicago, representing the Central Illinois Public Service Co.

LOVINGTON, ILL.—An ordinance has been passed by the Village Board providing for the sale of the municipal electric-light plant. The Central Illinois Public Service Co. has made an offer of $6,000 for the plant. The purchaser, it is reported, will be awarded a 10-year contract for street-lighting, at $600 per year, and furnish electricity to operate the water-works pumping station.

MATTOON, ILL.—The Central Illinois Trac. Co. has filed a notice with the Secretary of State of an increase in capital stock from $250,000 to $1,500,000.

MORRISON, ILL.—The Illinois Northern Utilities Co. has petitioned the highway commissioners of 12 townships in Whiteside County for permission to erect and operate high-tension transmission lines.

NEOGA, ILL.—The Village Board is negotiating with the Central Illinois Public Service Co. for lighting the streets of the village. A transmission line will probably be erected from Mattoon.

OLNEY, ILL.—The property of the Olney El. Lt. & Pwr. Co. is reported to have been purchased by the Central Illinois Utilities Co. for $100,000.

PAXTON, ILL.—The City Council has granted H. L. Clarke an extension of time until Jan. 1, 1913, to construct an electric system for lighting the streets of the city and for pumping water at the municipal water-works station.

PEORIA, ILL.—Plans are being prepared by the poor farm committee of the Peoria County Board of Supervisors for lighting the farm by electricity. The erection of a transmission line from Peoria or the installation of a plant at the farm is under consideration.

PORT BYRON, ILL.—The Village Board of Port Byron has passed an ordinance granting the People's Pwr. Co., of Moline, permission to install an electric-lighting system.

ROBERTS, ILL.—The installation of an electric-light plant to cost about $3,500 is being considered by the Board of Village Trustees.

SIDNEY, ILL.—The Village Board has granted U. S. Thompson, of Homer, a franchise to install and operate an electric-lighting system here. A transmission line will be erected from Homer to Sidney.

WESTFIELD, ILL.—Application will be made to the Village Board by the Central Illinois Public Service Co. for a franchise to install and operate an electric distributing system here. A transmission line will probably be extended from Mattoon.

MONTPELIER, IND.—The property of the Montpelier El. Lt. Co. was recently sold at sheriff's sale to the Citizens' Trust Co., of Fort Wayne, the trustee of the original bondholders, for $55,000. The purchasers will continue to operate the plant.

DELTA, IA.—The Sigourney El. St. & Pwr. Co. has been granted a franchise to supply electricity in Delta.

DES MOINES, IA.—It is reported that improvements representing an expenditure of about $8,000 will be made in the plant of the Des Moines El. Co.

GILMORE, IA.—A proposition will soon be presented to the city of Gilmore asking for a franchise for the installation of an electric-light and power plant.

GRUNDY CENTER, IA.—The City Council has contracted with the Grundy Center El. Co. for the installation of tungsten lamps to replace the present system. The contract calls for 10 150-watt lamps on Main Street and 66 60-watt lamps in the residence section.

HUBBARD, IA.—A special election has been called by the Village Board to vote upon a proposition to grant the Park Dam Co., of Eldora, Ia., a franchise to furnish electrical energy in the village. It is proposed to construct a transmission line from Eldora.

LINEVILLE, IA.—At an election held Aug. 16 the proposition to establish a municipal electric-light plant was carried. The cost of the plant is estimated at about $10,000. An engineer has not yet been engaged.

MAXWELL, IA.—The Cedar Rapids & Iowa City Ry. & Lt. Co., Cedar Rapids, contemplates extending its service to Maxwell. Col. William C. Dows is president and general manager.

OAKLAND, IA.—It is reported that nearly $2,000 has been subscribed toward an ornamental street-lighting system for this city.

OSAGE, IA.—The Elec. Lt., Ht. & Pwr. Co. is to install a new generator and change from 125-cycle to 60-cycle service.

ROLFE, IA.—At a special election held in Rolfe recently a franchise was granted to Ward Ferguson to install a lighting system in that city. Energy is to be furnished over a transmission line to be erected from the large power house at the Humboldt dam.

SHELDAHL, IA.—The installation of an electric-light system here is under consideration.

SPIRIT LAKE, IA.—Negotiations are under way which will result in James Ehret becoming the owner of the Spirit Lake El. Co. It is his intention to develop the plant further.

TOLEDO, IA.—The properties of the Tama & Toledo El. Ry. & Lt. Co. have been taken over by Messrs. Dow, Smith, Reed and Cook, of Cedar Rapids, Ia. The new owners also control the Cedar Rapids & Iowa Cty Ry. & Lt. Co.

WOODBINE, IA.—The proposition to grant a franchise to the Iowa-Nebraska Public Service Co., of Omaha, Neb., for which a special election was called for Aug. 6, has been defeated.

TOPEKA, KAN.—A petition is to be presented to the Board of City Commissioners by the taxpayers of North Topeka asking for a "great white way" from First Avenue to Gordon Street, on Kansas Avenue, a distance of about 2 1-2 miles.

FRANKFORT, KY.—Proposals will be received by John V. McDermott, chief engineer of the State Capitol power house, Frankfort, Ky., until Aug. 31 for changes and alterations of the piping in the State Capitol power house in accordance with plans and specifications on file in the office of the chief engineer.

LOUISVILLE, KY.—The Postal Teleg. Cable Co. has filed amended articles of incorporation at Louisville, which will enable it to maintain telephone as well as telegraph lines in this State.

SHELBYVILLE, KY.—The Middle West Utilities Co., of Chicago, Ill., has acquired the control of the properties of the Shelbyville Wtr. & Lt. Co., which operates electric-light, gas and water plants in Shelbyville. The new owners propose to make improvements to the system.

STANFORD, KY.—The Stanford Wtr., Lt. & Ice Co. is contemplating the installation of additional machinery with a view of establishing a day service. George L. Penny is general manager.

WILLIAMSTOWN, KY.—The City Council has awarded J. E. Shoop, promoter of the Williamstown El. Lt. Co., a franchise to construct and operate an electric-light plant here. A 55-hp oil engine and a 40-kw generator will be purchased for the plant.

LEWISTON, MAINE.—The Union Wtr. Pwr. Co., of Lewiston, in conjunction with other interests along the river, have decided to build a dam at the Pond-in-the-River, this fall.

BALTIMORE, MD.—Arrangements have been made whereby the old arc lamps and poles on Fulton Avenue, between Edmonson and Pennsylvania Avenues, will be replaced with "Baltimore" upright lamps.

BALTIMORE, MD.—It is announced by Robert J. McCuen, superintendent of the Department of Lamps and Lighting of Baltimore, that sealed proposals for furnishing electrical energy for use in the public streets, avenues and alleys of the city will be received by the Board of Awards, in care of City Register Gwinn. Specifications may be obtained at the office of superintendent of Department of Lamps and Lighting.

CRISFIELD, MD.—The plant of the Crisfield Ice & El. Co. was recently destroyed by fire.

CHICOPEE, MASS.—The Board of Aldermen has granted the Amherst Pwr. Co. a franchise to supply electricity in Chicopee.

LEOMINSTER, MASS.—The high school building committee is contemplating the installation of an electric-light and power plant at the high school.

MIDDLEBORO, MASS.—Plans are being considered for increasing the output of the municipal electric-light plant. It is proposed to replace the present waterwheels with new ones.

FRANKFORT, MICH.—It is reported that Eugene Zimmerman, of Cincinnati, has organized and incorporated the Benzie County Pwr. Co. with a capital of $75,000. It is stated that the water-power rights of the Betsy River have been secured, and that work is to be commenced at once on the erection of a dam which will develop 600 hp, to be followed by the construction of two other dams later on.

HOUGHTON, MICH.—Estimates have been submitted to Mayor Dodge by J. R. Carroll for the installation of a municipal electric-light plant, to cost about $40,000. The plans call for the installation of one 300-kw and one 500-kw generating unit, to be driven by turbine or cross-compound engines directly connected.

DELANO, MINN.—At the election held Aug. 13 the proposition to grant the Central Minnesota Lt. & Pwr. Co. a 20-year franchise to supply electricity here was carried. The company will take over the municipal electric-light system.

FOXHOME, MINN.—At an election held recently the proposition to install an electric-light system in Foxhome was carried.

MINNEOTA, MINN.—The Citizens' Lt., Ht. & Pwr. Co., Canby, has been granted a franchise to supply electricity here. Work will begin immediately on the erection of a transmission line from Canby to Minneota.

KANSAS CITY, MO.—The fire committee of the City Council has approved an ordinance permitting the property owners on Main Street, from Twenty-seventh to Thirty-first Street, and on Thirty-first Street, from Maine to McGee Street, to erect ornamental lamps on the trolley poles on both sides of the streets at their own expense. It is proposed to erect four 80-cp lamps on each post. The city will pay for the electricity consumed, provided the lighting fund will permit it.

SPRINGFIELD, MO.—The City Council has announced that it will not renew the contract for street lighting, which expires Sept. 8, with the Springfield Gas & El. Co. Estimates are being secured for the construction of a municipal electric-light plant.

MISSOULA, MONT.—Plans are being considered for the installation of an automatic fire-alarm system in Missoula.

BEATRICE, NEB.—It is reported that a new lighting system similar to that employed in Omaha is being planned for Beatrice by Mayor Meyer and members of the Commercial Club.

CLAREMONT, N. H.—The power plant of the Claremont Ry. & Ltg. Co. has been seriously damaged by fire, causing a loss of about $15,000. L. N. Wheelock is manager.

EAST ORANGE, N. J.—It is reported that Mayor Gregory is considering the advisability of purchasing electrical energy from the Orange municipal light plant, owing to dissatisfaction with the present rates for lighting service in East Orange.

ELIZABETH, N. J.—The Public Service El. Co. is planning the construction of an electric railway between Elizabeth and Milltown, by way of Woodbridge and Tremly.

JERSEY CITY, N. J.—Sealed proposals will be received by the committee on the high schools of the Board of Education of Jersey City, Room 34, City Hall, until Aug. 29 for furnishing and installing lighting fixtures in the William L. Dickinson High School, Newark and Paterson Avenues, Jersey City. Copies of specifications and blank form of proposals may be obtained at the office of John T. Rowland, Jr., supervising architect, 98 Sip Avenue, Jersey City. G. Fred Ege is secretary.

JERSEY CITY, N. J.—Bids will be received by the committee on School No. 25 of the Board of Education of Jersey City until Aug. 29 at the office of the board, Room 34, city hall, for all labor and material for enlargement of School No. 25, Hudson Boulevard and Zabriskie Street, as follows: (1) Mason work, including fireproofing; (2) carpenter work, including metal and roofing work; (3) painting; (4) plumbing and gasfitting work; (5) heating and ventilating work; (6) electrical work; (7) all work comprised in plans and specifications. Copies of plans and specifications and proposal blanks must be obtained at the office of John T. Rowlands, Jr., 98 Sip Avenue, Jersey City.

MIDLAND PARK, N. J.—The Borough Council has adopted a resolution authorizing Mayor Wostbrock to enter into a contract with the Public Service Corporation of New Jersey for 100 street lamps, to cost $18.77 each per year.

TRENTON, N. J.—Contracts for the construction of an electric railway connecting Elizabeth with Trenton and establishing a short line between New York and Philadelphia have been awarded by the Trenton Terminal Ry. Co. to J. F. Shanley & Co., Newark.

ALBANY, N. Y.—An application has been filed with the Public Service Commission, Second District, by the Northwestern Tel. & Teleg. Co. for permission to issue $11,000 of bonds, the proceeds to be used for a new switchboard, the construction of toll lines between Carthage and Black River, Harrisville and Benson Mines, and in other improvements and extensions.

BUFFALO, N. Y.—Plans have been completed by the Cataract Pwr. & Conduit Co. for the construction of a substation to supply electricity for its conduit system, to cost about $28,000.

COBLESKILL, N. Y.—A day service is to be installed in this city by the Courter El. Co., in order to furnish electrical energy for the operation of motors.

HUDSON, N. Y.—Several villages along the route of the Albany Southern R. R. Co. have made arrangements for the installation of electric street-lighting systems. The village of Niverville is negotiating for the erection of 40 electric lamps for street illumination. Negotiations are under way for street lamps in East Schodack, Nassau and East Greenbush.

JAMESTOWN, N. Y.—The power house of the Jamestown St. Ry. Co. was recently damaged by fire, causing a loss of about $25,000.

LOCK BERLIN, N. Y.—Press reports state that Lock Berlin is soon to be lighted by electricity, permission to install a lighting system having been granted to the Central New York Gas & El. Co., of Seneca Falls, N. Y.

NEW YORK, N. Y.—Proposals will be received by the Park Board, Department of Parks, Arsenal Building, Fifth Avenue and Sixty-fourth Street, New York, until Aug. 29 for furnishing all labor and materials for the erection of a power plant and workshop building in the Zoological Park, borough of the Bronx. Blank forms and other information may be obtained at the office of Department of Parks, Zbrowski Mansion, Claremont Park, borough of the Bronx. Charles B. Stover is president of the Park Board.

POUGHKEEPSIE, N. Y.—It is understood that work will be commenced at once by the Central Hudson Gas & El. Co. on the installation of a conduit system in this city which will represent an expenditure of about $42,000.

ROCHESTER, N. Y.—Permission has been granted to the Defender Photo Supply Co. to erect a power plant in connection with its new factory on Driving Park Avenue. The estimated cost of the building is given at $7,000.

SARATOGA, N. Y.—The Adirondack El. Pwr. Corpn., which has already spent $75,000 in construction work, is reported to be considering a further expenditure of about $500,000.

SOUTHAMPTON, N. Y.—The Suffolk Lt., Ht. & Pwr. Co. has received authority from the Public Service Commission to purchase from the Riverhead El. Lt. Co. that part of its franchise and system which it now owns and operates in the town of Southampton and to exercise the franchise granted to the Riverhead company. The Suffolk company is authorized to execute a mortgage upon its property to secure an issue of $300,000 in bonds, and to issue at this time bonds to the amount of $47,000, to be sold at not less than $85, the proceeds of $22,000 to be used to pay for the property of the Riverhead company in Southampton and $17,950 for extensions and improvements to its plant and distributing system.

WEEDSPORT, N. Y.—The question of establishing a municipal electric-light plant here is under consideration. The village may construct its own distributing system and purchase energy from the Rochester, Syracuse & Eastern R. R. Co. The franchise of the Weedsport El. Lt. Co. has expired.

KERNERSVILLE, N. C.—T. L. Hall, who recently petitioned for a franchise, contemplates the purchase of the equipment of the Citizens' Lt. & Pwr. Co. and extending the transmission line to Oak Ridge Institute, a distance of 6 miles.

WHITNEY, N. C.—Contracts have been awarded by the Southern Aluminum Co. for completing canal, masonry and power house for the development of 45,000 hp on the Yadkin River, preparatory to the erection of its large aluminum works here. The property was purchased from the North Carolina El. & Pwr. Co., which acquired the plant of the Whitney Co.

DICKINSON, N. D.—The contract for the installation of an ornamental lighting system in this city is reported to have been awarded to Grames & Peet for $8,567.

COLUMBUS, OHIO.—Bids will be received by S. A. Kinnear, director of public service, City Hall, Columbus, Ohio, until Aug. 30 for furnishing one vertical four-cylinder, four-cycle, water-cooled gasoline motor for direct connection to a 30-kw, 110-volt direct-current generator for use in thawing frozen water pipes. Plans and specifications are on file at the above office.

SPRINGFIELD, OHIO.—It is reported that Engineer C. C. Beckwith, of Cleveland, has submitted figures on electric-light plant to be operated in conjunction with the new pumping station. He estimates that it will cost $619,830 for a plant and distribution system, exclusive of building site and railroad facilities.

WASHINGTON C. H., OHIO.—The Washington Gas & El. Co. has applied to the Public Service Commission for authority to issue $100,000 in bonds for the purpose of paying its floating indebtedness and making extensions.

KINGFISHER, OKLA.—The contract for the electric-light and water-works extensions, bids for which were recently opened, has been awarded to the Connelly Constr. Co., of El Reno, for $47,450.

ELGIN, ORE.—The electric plant of H. D. Spencer & Co. was completely destroyed by fire recently.

PORTLAND, ORE.—The Portland Ry., Lt. & Pwr. Co. is planning to extend its Hawthorne Avenue car line from East Sixtieth and Division Streets to East Seventy-fourth Street.

CAMPHILL, PA.—The City Council has approved an appropriation of $300 to secure the services of an expert to investigate the cost of installing a municipal electric-light plant and water-works.

HARRISBURG, PA.—Formal papers providing for the merger of the Harrisburg Lt., Ht. & Pwr. Co. and the Paxtang El. Co. under the name of the Harrisburg Lt. & Pwr. Co. have been filed. The new company has a capital stock of $2,000,000 and authority to issue $2,000,000 in bonds. The company will proceed to make improvements and changes called for in the ordinance of the City Council which permitted the merger.

PINE GROVE, PA.—Preparations are being made for the construction of an electric-light plant in Pine Grove.

PITTSBURGH, PA.—Bids will be received until Sept. 2 by J. G. Armstrong, director Department of Public Works, for bronze lamps and a tablet on Lorimer Avenue bridge over Washington Avenue Boulevard.

CAMDEN, S. C.—The City Council has engaged Gilbert C. White, engineer, of Durham and Charlotte, N. C., to prepare plans for an electric-light plant and water-works system, for which bonds to the amount of $100,000 have been issued.

CHATTANOOGA, TENN.—Plans have been prepared by the Chattanooga Ry. & Lt. Co. for the construction of a double-track car line from the Western & Atlantic railroad crossing to the Citico switch, near Chattanooga. W. E. Boileau is general manager.

CHATTANOOGA, TENN.—The Birmingham & Chattanooga R. R. Co. contemplates the construction of an interurban electric railway about 177 miles long between Chattanooga and Birmingham, over Sand Mountain, via Boaz and Oneonta, Ala. Right-of-way across the river for an entrance into the city has been secured.

ALPINE, TEX.—The Alpine Pwr. Co. has been reorganized and is planning to install additional machinery in its electric plant. The capacity of its ice factory will also be increased.

BEAUMONT, TEX.—An ordinance requiring that all concealed electric wiring shall be placed in conduits has been adopted by the City Council as an amendment to the building code.

FORT WORTH, TEX.—Steps have been taken to organize a company to build an electric interurban railway between Fort Worth and Mineral Wells, a distance of about 60 miles. Dr. William Brown and associates are interested.

HOUSTON, TEX.—The Southern Pacific Co. is planning to enlarge its shops in Houston, at a cost of about $400,000. The plant will be equipped with electrically driven machinery.

MARBLE FALLS, TEX.—The unfinished reinforced concrete dam across the Colorado River in Marble Falls and other holdings of the Colorado River Pwr. Co. have been sold at sheriff's sale to the St. Louis Title Trust Co., which held a mortgage upon the property. The purchasing company, it is said, will complete the dam and install a large hydroelectric power plant.

NACOGDOCHES, TEX.—The Nacogdoches Lt. & Pwr. Co. and others have obtained an order from the court here restraining the City Council from installing a municipal electric-light plant and constructing a sewer system, for which bonds to the amount of $57,000 were recently issued.

PLEASANTON, TEX.—It is reported that the local ice company contemplates installing an electric-lighting system in connection with its ice plant.

ROGERS, TEX.—Plans are under way for the installation of a lighting system in this city, electrical energy to be secured from the Temple Lt. & Pwr. Co., Temple, Tex. G. L. Jones, M. V. Bauch and W. D. Wilson re interested in the proposition.

WICHITA FALLS, TEX.—The Wichita Falls El. Co., recently incorporated, has taken over the property and holdings of the Wichita Falls Wtr. & Lt. Co. and also the property of the Texas Utilities Corporation, which was held by the Wichita Falls Wtr. & Lt. Co. D. G. Fisher, W. H. Painter, P. B. Cruger, Frank Smith and C. Hunn, of Dallas, are directors.

RICHMOND, VA.—Plans have been filed by the Virginia Ry. & Lt. Co. for the construction of a new conduit distributing system on Broad Street.

ROCKBRIDGE BATHS, VA.—It is reported that a large hydroelectric plant is to be installed in this city, options having been recorded in the clerk's office of Rockbridge for the purchase of large areas of land along the Big Calf Pasture River, to be used as a storage basis for a dam in North River at Goshen Pass, near Rockbridge Baths. The promoter of the enterprise is W. J. Payne, of Richmond, who has had experience in building electric power plants at Danville and Newport News, and the options aggregate, it is said, nearly $50,000.

SEATTLE, WASH.—The Pacific Northwestern Trac. Co. has made arrangements with the Stone & Webster Engineering Corpn. for the construction of six new substations near Seattle.

SPOKANE, WASH.—The Inland Tel. & Teleg. Co. has applied to the County Commissioners for a franchise to construct a telephone line from Spokane to Lewiston, Idaho, a distance of about 90 miles.

WALLA WALLA, WASH.—The construction of an electric line from Walla Walla, Wash., to Union, Ore., is under consideration. W. A. Terrell, of Union, and others are interested.

WARWOOD, W. VA.—Application is to be made on Sept. 10 to the City Council by the Brooke El. Co. for a franchise to construct, operate and maintain an electric-light plant in the city of Warwood.

WHEELING, W. VA.—Plans are being prepared by the Board of Control for the construction of a municipal electric-light plant, to cost about $110,000. C. B. Cooke, civil engineer, is in charge.

BARABOO, WIS.—The installation of an ornamental street-lighting system in the business district is under consideration. The Baraboo Gas & El. Co. is planning to make improvements to the street-lighting system.

CLARESHOLM, ALTA., CAN.—The engine in the municipal electric plant was seriously damaged by fire recently, putting the plant out of commission. The town wil be without electric service for several weeks.

CLAYBURN, B. C., CAN.—The British Columbia El. Ry. Co. is planning to extend its line from Clayburn to Mission City, B. C.

KAMLOOPS, B. C., CAN.—A fu'l report for the proposed hydro-electric power plant on the Barrier River and a steam auxiliary plant for the city has been submitted to the City Council by Butcher, Maxwell & Co. To develop 6000 hp the cost is estimated at $237,600, including $21,600 for contingencies. The cost of a 7500-hp plant is estimated at $473,000 and that for a plant of 11,000 hp at $840,000. The cost of the steam auxiliary plant is estimated at $122,040.

NELSON, B. C., CAN.—The West Kootenay Pwr. & Lt. Co. contemplates enlarging its power plant in aniticipation of the equipping of the Canadian Pacific Railroad for electrical operation from Rossland to Castlegar next year. J. D. McDonald is general superintendent.

NORTH VANCOUVER, B. C., CAN.—The City Council is contemplating the installation of an ornamental street-lighting system on Lonsdale Avenue to cost about $30,000. It is proposed to install a similar system on First Street and Mahon Avenue, at a cost of about $15,000.

WINNIPEG, MAN., CAN.—Bids will be received at the office of M. Peterson, secretary Board of Control, for furnishing Winnipeg 100 ornamental lighting standards.

FOREST, ONT., CAN.—A by-law authorizing the purchase of the local electric-light plant, to be owned and operated by the municipality, will soon be submitted to the ratepayers.

MONTREAL, QUE. CAN.—At a recent meeting of the Crown Reserve Mining Co. held in this city it was announced that the construction of a new power house is to be commenced at once.

MONTREAL, QUE., CAN.—It is reported that an issue of $5,000,000 additional capital stock is being considered by the Shawinigan Water & Pwr. Co., the proceeds to be utilized for extensions to its plant.

GUADALAJARA, MEXICO.—The Chapala Hydroel. & Irrig. Co. is constructing a branch transmission line to the Hostotipaquillo district in the State of Jalisco. The company is already supplying electrical energy to a number of mines in the territory west of Guadalajara.

HOSTOTIPAQUILLO, JALISCO, MEXICO.—It is reported that the United States Smelting, Refining & Mining Co., of Boston, which recently acquired an option on the San Pedro Analco silver mines in this district, also plans to install a hydroelectric plant near the property. The Negociacion Minera de San Pedro Analco, which has given the option, constructed a dam across the Santiago River some time ago as a preliminary part of its plans for installing a hydroelectric plant, and this will be used by the United States company if the purchase is consummated.

## New Industrial Companies

THE AUTO-PILOT LAMP COMPANY has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $25,000. The incorporators are: H. B. Martin, E. T. Vennel, of Camden, N. J., and C. U. Martin, Philadelphia, Pa.

THE CANTON ELECTRIC LAMP COMPANY, of New York, N. Y., has been incorporated by L. Danby, I. Menoff, P. Menoff, A. A. Canton and S. Block. The company is capitalized at $10,000 and proposes to manufacture electric lamps, etc.

THE HI-GRADE SUCTION SWEEPER COMPANY, of New York, N. Y., has been incorporated with a capital stock of $25,000 by H. R. Bernard, G. Klumpp and L. C. Dailey. The company proposes to manufacture and deal in vacuum and other cleaning appliances.

THE MASSACHUSETTS TELEPHONE HERALD COMPANY has been incorporated under the laws of the State of Delaware with a capital stock of $1,000,000. The incorporators are: R. B. Cooling, C. J. Jacobs and H. W. Davis, Wilmington, Del.

THE MUELLER ELECTRIC COMPANY, of Ottawa, Ill., has been incorporated with a capital stock of $5,000 by John J. Mueller, Jr., B. Mueller and J. J. Mueller. The company proposes to do a general electrical business.

THE NEW YORK ELECTRIC VEHICLE ASSOCIATION, New York, N. Y., has been chartered with a capital stock of $50,000 to manufacture and deal in motors, engines and machinery. The incorporators are: G. Tiernan, F. H. Parcell and R. G. Redlefsen.

THE PEERLESS INSULATED WIRE & CABLE COMPANY has been incorporated under the laws of the State of Delaware with a capital stock of $1,000,000. The incorporators are: R. B. Cooling, C. J. Jacobs and H. W. Davis, of Wilmington, Del.

THE SIDEWALK LIGHT COMPANY OF AMERICA has filed articles of incorporation under the laws of the State of Delaware. The company is capitalized at $75,000 and the incorporators are: E. E. McWhiney, V. J. Maloney and N. P. Coffin, Wilmington.

## New Incorporations

SAN FRANCISCO, CAL.—The Davis El. Co. has been granted a charter with a capital stock of $25,000. The incorporators are: A. F. Cripps, J. M. Rich and M. B. Gallagher.

CHICAGO, ILL.—The Union Ry. & Pwr. Co. has been granted a charter with a capital stock of $10,000. The incorporators are: Thomas Simeon, Jr., F. Arthur Jost and John J. Maguire.

INDIANAPOLIS, IND.—The Indiana Hydraulic Trans. Co. has been incorporated with a capital stock of $200,000 by W. K. Ernest and Paul Milhauland.

BROOKLYN, N. Y.—The Santa Clara Lt. & Pwr. Co. has been incorporated with a capital stock of $800,000. The directors are: S. J. Bischoff, Peter J. Brancato and David J. Broderick, of Brooklyn. The principal office of the company will be located in New York.

SAND SPRINGS, OKLA.—The Sand Springs Pwr., Lt. & Wtr. Co. has been incorporated with a capital stock of $25,000 by Edwin A. Page, of Sand Springs; Charles Page, C. F. Tingley, George W. Kinney and C. W. Kingsbury, all of Tulsa.

PHILADELPHIA, PA.—The Civic Service Corpn. has been incorporated to take over and operate the public utility and general engineering business which has been conducted by T. Wilson Battin and A. L. Osgood. G. Henry Stetson is president of the company, T. Wilson Battin vice-president and secretary, J. Lee Patton treasurer, and A. L. Osgood general manager.

SCHULENBERG, TEX.—The Schulenberg Lt. & Ice Co. has been incorporated with a capital stock of $20,000 by G. Russek, Charles A. Bogt and E. J. Russek.

SEATTLE, WASH.—The Cascade Pwr. & Trac. Co. has been incorporated with a capital stock of $1,200,000. Clyde C. Chittendon and Ralph G. Chittendon are directors.

UFFINGTON, ONT., CAN.—The Muskoka, Victoria & Haliburton Tel. Co. has been incorporated with a capital stock of $200,000 to build and operate a telephone system in the townships of Draper, Oakley and other towns in the district of Muskoka. The directors are: J. A. Boyes, G. W. Small, Oakley; Albert Fawcett, Bracebridge, and Charles Mickle, Gravenhurst.

# Trade Publications

WIRE HANDBOOK.—The Standard Underground Cable Company, Pittsburgh, Pa., sends the announcement that the last edition of its handbook is exhausted. Persons whose applications the company was unable to fill will receive copies of the next edition when it appears.

CARTRIDGE FUSE SHELLS.—The F. A. Daum Company, Pittsburgh, Pa., tells the story of the Daum refillable cartridge fuse shells for electric circuits in a twenty-four-page catalog designated as No. 15. Price lists, a wiring table, current required by motors and report of tests made of the Daum fuses are found in this catalog.

RECORDING PRESSURE GAGES.—Bulletin No. 65, issued by the Industrial Instrument Company, Foxboro, Mass., has just been published and refers to its recording gages, listing nearly 2000 different pressure ranges, in three sizes of dial. These cover all purposes and pressures from full vacuum to 10,000 lb. per square inch. The bulletin is fully illustrated and contains brief descriptions of the constructive features of these instruments.

LIGHT REGULATOR—The dim-a-lite (a portable attachment for dimming a single electric lamp) is the subject of a sixteen-page pamphlet issued by the Wirt Electric Specialty Company, of Germantown, Pa. Poetical quotations on various shades of light, showing the dim-a-lite used in different rooms in a house, and short, terse sentences referring specifically to the use of the lamp in the room illustrated, including prices and a report of a Bureau of Standards test on a dim-a-lite, complete this booklet.

ELECTRICAL SPECIALTIES.—W. N. Matthews & Brother, St. Louis, are sending out with their imprint Catalog No. 8, compiled by Mr. Claude L. Matthews. The first 100 pages are devoted to descriptions and illustrations of Matthews specialties. The remainder of the book, which contains 152 pages, is made up of useful data on the construction end of the electrical business. Twenty-two pages of diagrams and illustrations are devoted to the Matthews guy anchor, showing actual photographs of the method of placing.

ILLUMINATION FOR INSURANCE COMPANIES AND BANKS.—Catalog No. 408, recently distributed by the H. W. Johns-Manville Company, gives in very attractive form a description of the applications of Frink reflectors in banks and insurance offices and for office lighting in general. The Johns-Manville Company is the sole selling agent for the I. P. Frink lighting specialties. Among the special applications illustrated are reflector arrangements for accountants' desks, large file racks, typewriter desks, wall tables and cornice lighting.

AUTOMOBILE AND MOTOR-BOAT LIGHTING.—A bulletin describing a small generator for furnishing electric-lighting service on automobiles and motor boats has been issued by C. F. Splitdorf, 263 Walton Avenue, New York. The Splitdorf generator is a highly efficient type of magneto arranged for mounting on the engine base, with gear or chain drive. The lighting or ignition service is obtained from a battery when the magneto is not in operation, the latter being cut in by an automatic governor when it attains sufficient speed.

ELECTRIC WELDING MACHINES.—An exceedingly attractive front cover invites one to the not less attractive pages of the catalog of the Thomson Electric Welding Company, Lynn., Mass. A page with a brief description and clear illustration is given to each type of machine, and a list of the industries in which electric welding is employed shows the wide uses of electric welding machines. Data on metals, alloys and combinations of different metals actually welded by the Thomson process, besides wire data, complete a very creditable catalog.

COMBUSTION.—The Uehling Instrument Company, of Passaic, N. J., has its imprint on a new publication containing much information on combustion and boiler efficiency, boiler-room economy, losses and wastes, and other matters of interest to the engineer. In the 16-page booklet issued by the Uehling Company on its $CO_2$ meters are described in concise manner the $CO_2$ and waste meters and the recorders and indicators which are combined in different ways to form various styles of $CO_2$ and waste-meter equipment. Six styles of machines are illustrated.

PRESSURE AND TEMPERATURE GAGES.—The Industrial Instrument Company, Foxboro, Mass., has recently distributed its Bulletin No. 60, describing the Foxboro indicating and recording pressure gages for liquids and gases. Numerous types are attractively illustrated and a full table of dimensions is appended. This bulletin also describes an industrial dial type of thermometer, which is designed for conditions where it would be very difficult or impossible to employ a glass-stem thermometer of the ordinary type. A full price list is included.

DIESEL ENGINES.—"The Present Status of the Diesel Engine in Europe and a Few Reminiscences of the Pioneer Work in America" is the comprehensive title of a lecture delivered by Dr. Rudolf Diesel before various engineering societies, colleges and universities. A reprint of this lecture has been issued by the Busch-Sulzer Brothers-Diesel Engine Company, of St. Louis, Mo. The pamphlet is of general historic interest. The illustrations and descriptions of various types of the Diesel engines in many and diverse installations add considerable value to the publication.

CABLE TERMINALS.—Two booklets on the Davis station terminals have been issued, one asking "Are you acquainted with Davis station terminals?" and giving to the unacquainted information, illustrations and diagrams, and the other, entitled "D. O. A. Terminals," going quite fully into its subject of Davis open-air terminals. Information desirable for the prospective purchaser in making inquiries is included. Both booklets are printed in two colors and they are uniform in size. They have been issued by the Standard Underground Cable Company, Pittsburgh, Pa.

LAMP ADVERTISEMENTS.—The department of publicity of the "National Quality" lamp division of the General Electric Company has compiled and is distributing a "Mazda Ad Book," containing suggested models for newspaper advertising copy suitable for use by central stations, electrical dealers and contractors. The advertisements, which set forth the advantages of electric light and of "National Quality" Mazda lamps, are well written and attractively illustrated. Successful results are being reported by the various concerns which have followed out the suggestions given.

ALUMINUM CONDUCTORS.—The British Aluminum Company, Limited, 109 Queen Victoria Street, London, E. C., England, has recently distributed a pamphlet entitled "The Characteristics of Aluminum Overhead Line Conductors," prepared by Mr. E. V. Pannell. The contents of this pamphlet appeared originally in the *London Electrical Review* and were abstracted in the *Electrical World's Digest* in the issues of June 1 and June 8. This pamphlet will be of special interest to engineers and others contemplating the use of aluminum conductors for the transmission of electrical energy.

ELECTRICAL INSTRUMENTS.—Pressure and vacuum gages are illustrated and described on a large scale in Catalog No. 1000, issued by the Bristol Company, Waterbury, Conn. Full-size fac-simile sections of a 12-in. chart with record of draft in sack for a B. & W. boiler, as recorded by a Bristol recording vacuum gage, are given, as is another similar chart with a twenty-four-hour record of top gas pressure, recorded by one of the company's combination pressure and vacuum gages connected to a gas main near the dust catcher of a large blast furnace. Copies of other sample charts are included.

ELECTRICAL SUPPLIES.—A massive catalog has recently been issued by the Central Electric Company, 320 Fifth Avenue, Chicago, Ill. It is thoroughly complete, no detail apparently having been overlooked. Value is added by the excellent indexing and cross-indexing. Any given material or apparatus can be located immediately. The catalog contains also much descriptive material of definite value to every user of electrical supplies. The book is bound in cloth and has been produced at much expense. It is a distinctive addition to catalog literature and its publishers are to be commended on its production.

RAILWAY SUPPLIES.—Catalog No. 12 of the Ohio Brass Company, Mansfield, Ohio, with its 490 pages, covers the complete line of appliances used in the construction, maintenance and operation of electric railways, mine haulage systems and transmission lines manufactured by this company. The description and illustration of each appliance is followed (on the same page in most instances) with the price list. Various tables of comparative weights of solid copper and aluminum wires and cables, properties of bare and insulated stranded copper cable and others of value to the street railway man are included.

DIRECT-CURRENT MACHINERY.—The Westinghouse Electric & Manufacturing Company has recently issued the following leaflets describing the various forms of direct-current apparatus mentioned below: No. 2303, on crane motors, detailed and completed views being shown; Nos. 2313, 2314 and 2315, on commutating-pole mine motors; No. 2464, rheostats for motors; No. 2377, box-frame interpole railway motor for locomotive work; No. 2376, box-frame interpole railway motor for use on 600-1200-volt service; No. 2370, various details of railway motors such as bearings, brush holders, commutators, field coils, etc.; No. 2368, strap-wound armature coils of railway motors—this leaflet contains a reprint from the *Electric Railway Journal* on the subject "Square Wire or Strap Copper Construction"; No. 2444, equalizer flywheel hoisting sets—this leaflet shows application and diagrammatic views of these sets and contains a full explanation of their method of operation; No. 2393, dynamotor compressor for 1200-1500-volt service.

# Business Notes

MR. ADOLPH C. KRIEGER, formerly publicity manager of the Busch-Sulzer Brothers Diesel Engine Company, has opened an office at 916 Victoria Building, St. Louis, Mo., for the sale of the Tacchella oil-burning device, which is described as being suitable for domestic heating purposes, japanning and annealing ovens, baking ovens, cooking ranges, etc.

GENERAL VEHICLE COMPANY.—Recent sales made by the General Vehicle Company include an initial order from the Consolidated Gas Company, New York, for five 2000-lb. and three 750-lb. trucks; from the Kingan Packing Company, an additional order for two 3½-ton trucks, to be used in Richmond, Va.; two additional tower wagons for the Milwaukee Railway & Light Company, and four additional wagons for the Hartford Electric Light Company. The General Vehicle Company is now building delivery wagons for nine different department stores.

THE NIAGARA SEARCH LIGHT COMPANY.—Among the exhibits at the electrical jobbers' meeting held at the Clifton Hotel, Niagara Falls, Ont., Aug. 14, 15 and 16, was the display of the Niagara Search Light Company, which manufactures portable lamps in different styles and types, one of the largest of which is intended for use by fire department chiefs. Smaller sizes and styles are made for attachment to the helmets of firemen and the caps of bands and other uniformed organizations. Hand types are also made for use in automobiles, motor boats and by hunters and campers. On the evening of Aug. 14 a band of twenty pieces equipped with cap lamps serenaded the jobbers.

# Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED AUG. 13, 1912.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,035,133. ELECTROLYTIC CELL; E. A. Allen, Portland, Me. App. filed Aug. 24, 1907. Diaphragm type for saline solutions.

1,035,149. INCANDESCENT ELECTRIC LAMP SOCKET; C. H. Bissell, Syracuse, N. Y. App. filed Oct. 6, 1910. Rotary-button, snap type.

1,035,157. TELEPHONE SYSTEM; H. P. Clausen, Chicago, Ill. App. filed March 23, 1901. Central-station energy with retardation coils as relays.

1,035,158.; TELEPHONE APPARATUS; H. P. Clausen, Chicago, Ill. App. filed March 11, 1903. Subscribers' set for cutting down "side tones."

1,035,172. TELEPHONE SYSTEM; A. H. Dyson, Chicago, Ill. App. filed July 24, 1903. All-metal-line connection with lamp signals and line and supervisory relays.

1,035,167. BATTERY PLATE; E. G. Dodge, South Orange, N. J. App. filed Dec. 26, 1908. Enameled-iron backing with compressed copper oxide.

1,035,172. TELEPHONE SYSTEM; A. H. Dyson, Chicago, Ill. App. filed April 14, 1902. Trunking system between a centralized call exchange and a common-battery exchange.

1,035,173. TELEPHONE APPARATUS; A. H. Dyson, Chicago, Ill. App. filed July 24, 1903. Trunking system with central common-battery and metallic-lined connections with the substations.

1,035,178. ELECTRIC BATTERY; C. D. Galloway, Jr., Elizabeth, N. J. App. filed Feb. 1, 1912. A vented secondary battery.

1,035,204. SYSTEM FOR MEASURING THE CAPACITY OF ELECTRICAL CONDUCTORS; O. M. Leich and C. E. Hague, Rochester, N. Y. App. filed July 16, 1907. An electrical key operates mechanism for charging and discharging conductors.

1,035,212. INSULATOR; L. McCarthy, Boston, Mass. App. filed Jan. 21, 1911. A coupling for light fixtures, ball-strains and trolley-wire insulators.

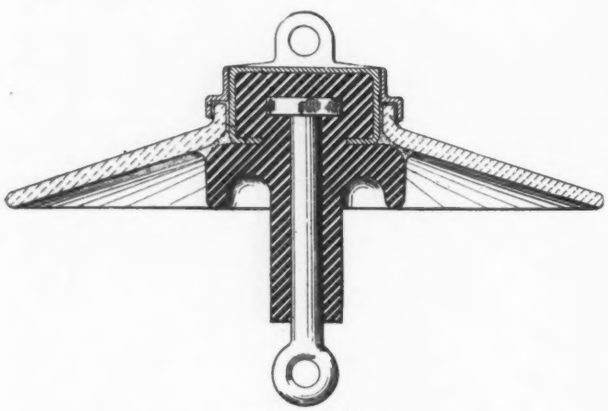
1,035,215. ELECTRODE. M. McGary, Helmar, Idaho. App. filed April 22, 1909. A metal casing to contain a sponge.

1,035,227. ELECTRIC CONNECTOR; L. F. Parkhurst, Binghamton, N. Y. App. filed Nov. 25, 1911. For connecting a flat-ribbon resistance and a round or stranded conductor.

1,035,231. INSULATOR; L. M. Randolph, Newark, N. J. App. filed Oct. 17, 1910. A metal center with porcelain petticoat.

1,035,247. MEANS FOR ATTACHING BINDING POSTS TO DRY BATTERIES; W. A. Scott, Tacoma, Wash. App. filed Nov. 11, 1911. Slotted engagement between the post and the zinc.

1,035,249. LOCOMOTIVE CURRENT-SUPPLYING MECHANISM; F. L. Sessions, Columbus, Ohio. App. filed Feb. 18, 1908. Trolley device for mine use.



1,035,231.—Insulator.

1,035,257. INSTRUMENT FOR TEACHING TELEGRAPHIC CODES; T. M. St. John, New York, N. Y. App. filed Aug. 8, 1910. A metal plate with insulating enamel forming dot and dash patterns.

1,035,280. MANUFACTURE OF STEEL; W. R. Walker, New York, N. Y. App. filed April 28, 1911. Blown metal is refined in an acid electric furnace and then transferred to a mixing ladle.

1,035,292. SOUNDER; E. C. Wood, Somerville, Mass. App. filed Sept. 22, 1909. Vibrating device for submarine signaling.

1,035,325. BATTERY ELEMENT; E. G. Dodge, South Orange, N. J. App. filed Dec. 26, 1908. Enameled-iron backing with zinc surface.

1,035,326. PROCESS OF MAKING BATTERY PLATES; E. G. Dodge, South Orange, N. J. App. filed Dec. 26, 1908. Depolarizing material is compressed on an enameled surface and then fired.

1,035,334. WIRELESS TELEGRAPHY; R. A. Fessenden, Brant Rock, Mass. App. filed July 19, 1909. A shield for apparatus in an iron battleship, etc.

1,035,338. LIGHTNING ARRESTER; F. T. Forster, Schenectady, N. Y. App. filed Dec. 12, 1908. Aluminum type having a plurality of cells in a single tank.

1,035,354. SIGNAL TRANSMITTER; W. Kaisling, Chicago, Ill. App. filed May 3, 1907. Semi-automatic telephone desk stand.

1,035,355. TELEPHONE SUPPORT; W. Kaisling, Chicago, Ill. App. filed May 3, 1907. Automatic telephone desk stand with finger-hold.

1,035,373. ALTERNATING-CURRENT INDUCTION MOTOR; B. McCollum, Washington, D. C. App. filed March 11, 1912. Closed-slot type with thin magnetic bands.

1,035,380. SUPPORT AND HOUSING FOR ELECTRIC-SWITCH MOUNTING; S. Morris, Hartford, Conn. App. filed July 23, 1909. A V-shaped supporting member for a flush wall switch.

1,035,394. ALTERNATING-CURRENT DISTRIBUTING SYSTEM; S. D. Sprong and W. E. McCoy, New York, N. Y. App. filed Oct. 16, 1911. A plurality of interconnected transformers with an overload fuse.

1,035,415. INSULATOR; R. L. and G. Brown, Mayview, Mo. App. filed March 1, 1911. Pin insulator with lateral slots.

1,035,443. COMBINED COUPLING AND NIPPLE FOR ELECTRIC OUTLET BOXES; O. Von Humrick, Detroit, Mich. App. filed May 16, 1910. Connection for conduit.

1,035,489. APPARATUS FOR THE PRODUCTION OF OZONE; J. Steynis, Bayshore, N. Y. App. filed Jan. 18, 1911. Tubular type. (See Process Patent No. 906,468.)

1,035,493. TELEPHONE-LINE SELECTIVE-SWITCH DEVICE; J. H. Swanson, Minneapolis, Minn. App. filed March 8, 1910. Substation apparatus. (Improvement on Patent No. 941,743.)

1,035,494. TROLLEY WHEEL; W. F. Swoveland, Altoona, Pa. App. filed Jan. 14, 1910. Spring-supported.

1,035,499. CABLE-ARMOR JOINT; W. P. Traver and L. F. Theis, San Francisco, Cal. App. filed April 5, 1912. Threaded bars for relieving strain.

1,035,501. ELECTRICAL DEVICE FOR CONTROLLING FROM A DISTANCE ANY NUMBER OF MOVEMENTS; P. Viry, Suresnes, France. App. filed Aug. 9, 1909. A vibratory controlling device. For projectors, enunciators, etc.

1,035,541. AMALGAMATOR; C. F. Cropsey, Chicago, Ill. App. filed Aug. 15, 1910. Rotatable device for extracting ore from fluids.

1,035,555. ELECTRIC HEATER; E. C. Donaldson, Detroit, Mich. App. filed Nov. 5, 1910. Electric lamp pad.

1,035,563. SAFETY DEVICE FOR ELECTRIC-CURRENT MACHINERY; J. M. S. Fontecha, Mexico, Mexico. App. filed Oct. 11, 1911. Knife-blade switch type.

1,035,568. TELAUTOGRAPH; R. T. Frazier, Jr., Washington, D. C. App. filed Aug. 17, 1908. Movement of a stylus controls the action of three coils in different planes.

1,035,572. ALARM-SOUNDING DEVICE; R. A. Gasch, Seattle, Wash. App. filed April 29, 1911. Boiler-pressure alarm.

1,035,577. TELEPHONE RECEIVER; S. P. Grace, Pittsburgh, Pa. App. filed Oct. 17, 1910. A rotating metallic disk for magnifying sound.

1,035,581. APPARATUS FOR PRODUCING ENDOTHERMIC REACTIONS IN GASES; P. A. and C. A. Guye, Geneva, Switzerland. App. filed Dec. 14, 1908. A plurality of vertical tubes for the fixation of nitrogen.

1,035,593. MOTOR STARTER; C. Jewell, Baltimore, Md. App. filed Jan. 21, 1911. Automatic starter with solenoids and cushioning devices.

1,035,596. ELECTRIC FURNACE; M. J. Johnson, Naugatuck, Conn. App. filed Dec. 1, 1910. A quartz lining, a resistance layer, an insulating layer and an aluminum casing.

1,035,608. METHOD OF SMELTING SULPHIDE ORES; S. B. Ladd, Washington, D. C. App. filed July 3, 1906. Heat is electrically developed in the molten bath beneath the charge.

1,035,633. APPARATUS FOR CLEANING METAL ARTICLES; J. D. Phillips and C. Hambuechen, Madison, Wis. App. filed June 22, 1911. A perforated zinc container with a tinned grid.

1,035,684. METHOD OF PRODUCING COMPOUNDS OF OXYGEN AND NITROGEN; P. Punet and A. Badin, Salindres, France. App. filed July 22, 1909. An arc is formed in a restricted space and extinguished by a cooling fluid.

1,035,692. ADAPTER; T. Deaderick, Nashville, Tenn. App. filed Oct. 16, 1911. For flush plugs with screw socket.

1,035,705. RAILWAY SIGNALING SYSTEM; L. F. Howard, Edgewood Park, Pa. App. filed April 23, 1910. Polyphase transmission with compensating means.

1,035,710. HOT-BEARING ALARM; R. J. Jobson, Kinston, N. C. App. filed Jan. 27, 1911. Chamber with mercury and contact.

1,035,717. DYNAMO-ELECTRIC MACHINE; J. C. Macfarlane and H. Burge, Chelmsford, England. App. filed April 5, 1909. Single-ring armature with meter-and generator windings.

1,035,723. METHOD AND APPARATUS FOR PRODUCING CHEMICAL REACTIONS IN A MASS OF GASES; A. A. Naville and P. A. and C. E. Guye, Geneva, Switzerland. App. filed Sept. 28, 1906. Magnetically rotated arc with continuous gas supply.

1,035,767. TROLLEY WHEEL AND SWITCH; S. L. Barringer, Winston Salem, N. C. App. filed Oct. 28, 1911. Switch-frog guide plate.

1,035,777. PROCESS OF IMPREGNATING SUBSTANCES; A. R. Bullock, Cleveland, Ohio. App. filed Dec. 17, 1910. Chemical treatment of meat, hides, etc., in the presence of a magnetic field.